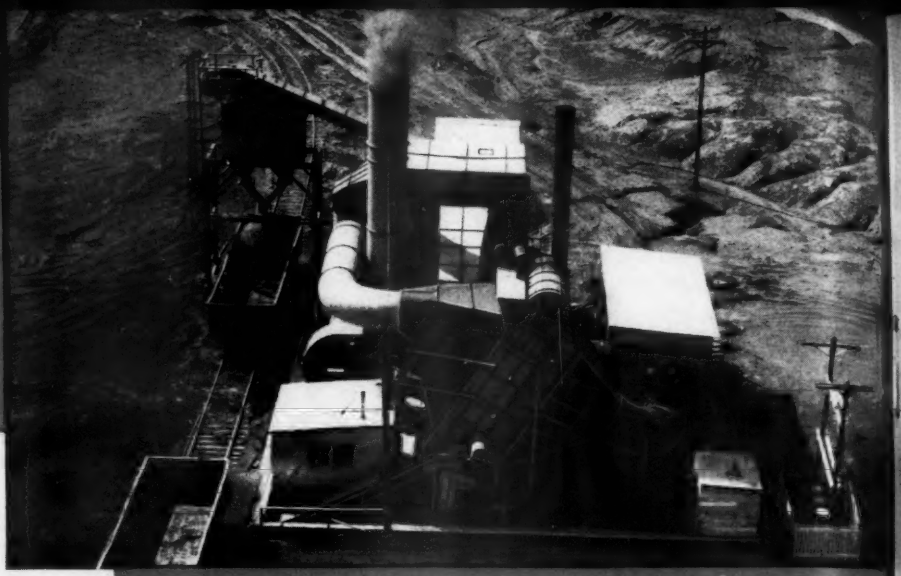
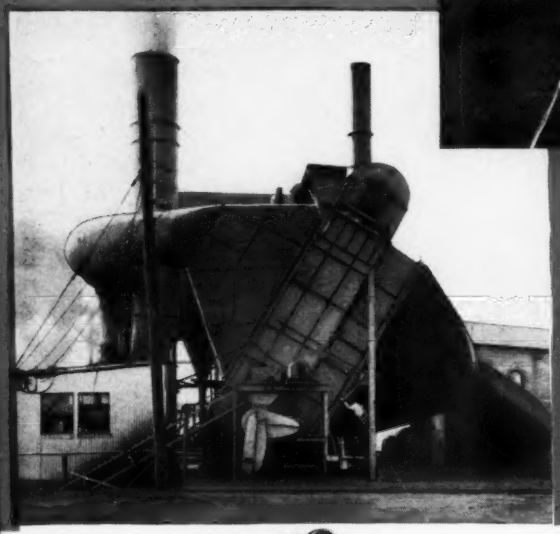
Mining CONGRESS JOURNAL

AMERICAN MINING CONGRESS

FEBRUARY
1950

At right: View showing flight conveyors, dust collectors and hot air furnace. Fine coal from the dust collectors is used for firing the furnace. Below: Another view showing dryer, hot air ducts and inclined feeder conveyor.





LINK-BELT Multi-Louvre Dryer Reclaims Coal from Slurry Dumps

MULTI-LOUVRE dryer, such as used in coal preparation plants.

Another example of the use of Link-Belt equipment to raise efficiency and save money in the coal industry is afforded by a MULTI-LOUVRE dryer plant in the coal fields, put in to handle 35 T.P.H. of reclaimed slurry taken from dump piles. A considerable amount of this sludge, the greater percentage of which is minus No. 28 mesh, is available to be dried for use as pulverized fuel in public utility plants.

The product as reclaimed has about 12% surface moisture; the sludge is dried down to 1% surface moisture.

The sludge is delivered to the dryer plant by trucks or railroad cars and dropped into a dump hopper. It leaves the dump hopper on an inclined feeder-conveyor and is dropped into the screw conveyor feeding the dryer. The discharged product is removed from the dryer by an inclined flight conveyor to a transfer point where it is conveyed at right angles by another inclined flight conveyor to the loading hopper, from whence it is discharged into railroad cars.

We'll be glad to work up for you a similar sludge drying installation or other types of coal drying plants where the MULTI-LOUVRE dryer works out so well in drying coal.

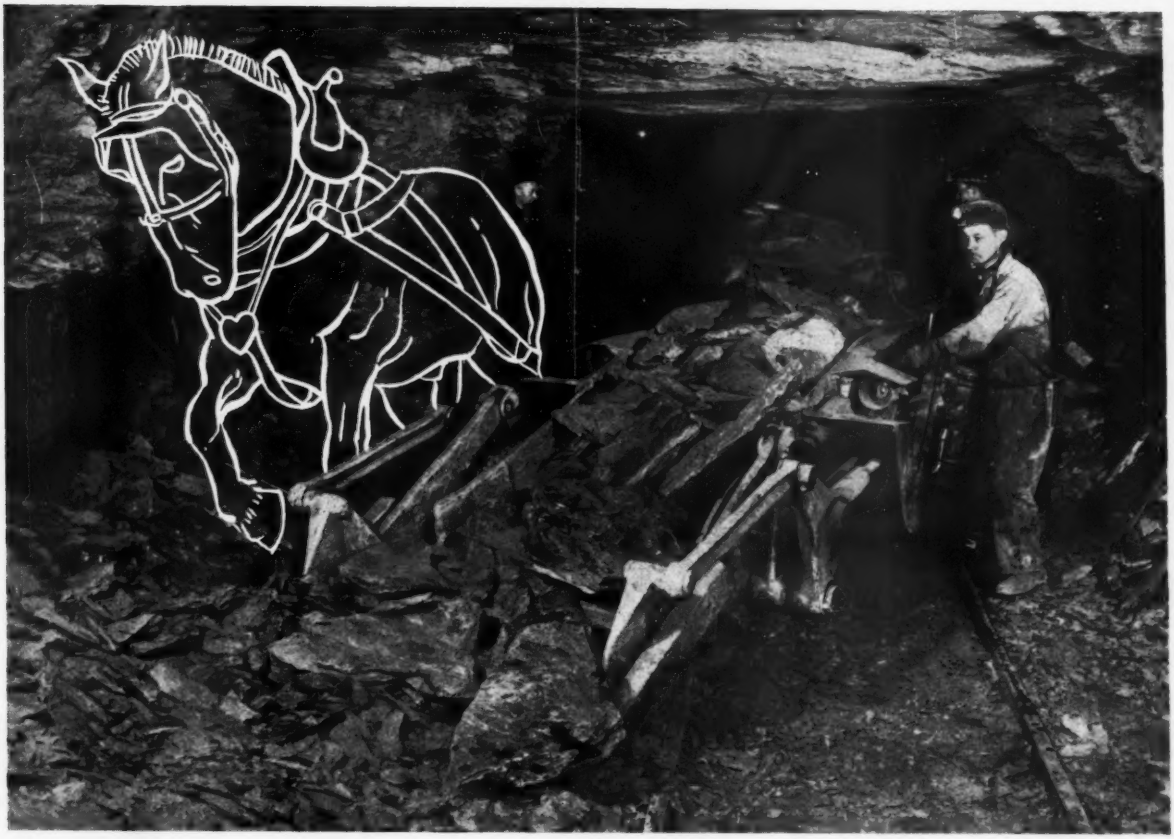
LINK-BELT COMPANY

Chicago 9, Philadelphia 40, Pittsburgh 13, Wilkes-Barre, Huntington, W. Va., Louisville 2, Denver 2, Kansas City 6, Mo., Cleveland 15, Indianapolis 6, Detroit 4, Birmingham 3, St. Louis 1, Seattle 4, Toronto 8.

11,622

COAL PREPARATION AND HANDLING EQUIPMENT

Engineered and Built by LINK-BELT



The WORKHORSE Of The Mining Industry!

Regardless of the material that must be moved out of your mine—be it coal, rock, or slate—count on the rugged Whaley "Automat" to load it quickly, effectively and, bear in mind, consistently.

As one prominent coal operator recently said, "Without these machines, cost of rock work would have made us close several of our mines." Operators are checking up on such service and putting the shovel-action "Automat" to work for tonnage loading . . . rapid entry development . . . for quick clean-up of falls . . . for reopening of old entries and air courses prior to pillar recovery . . . for making grades. All of these uses mean there's seldom an idle minute in the life of an "Automat!" It's this constant, efficient high-capacity loading day-in and day-out that has made the shovel-action "Automat" the "Workhorse of the mining industry!" Myers-Whaley Company, Knoxville, Tenn.

MYERS-WHALEY CO.

"MECHANICAL LOADERS EXCLUSIVELY FOR OVER 40 YEARS"

A sequence showing the JOY Continuous Miner completing a break-through: *Above,* getting ready for a sweep from floor to roof. *Below,* a moment later, the JCM beginning the cut. Note the safe position of the operator, 14 ft. back from the face.

Maximum Production

★ Greatest Safety

★ Lowest Cost per Ton

That's the PROVED Operating Record

of the JOY CONTINUOUS MINER

What can it do for You?

WRITE FOR BULLETIN, OR *Consult a Joy Engineer*

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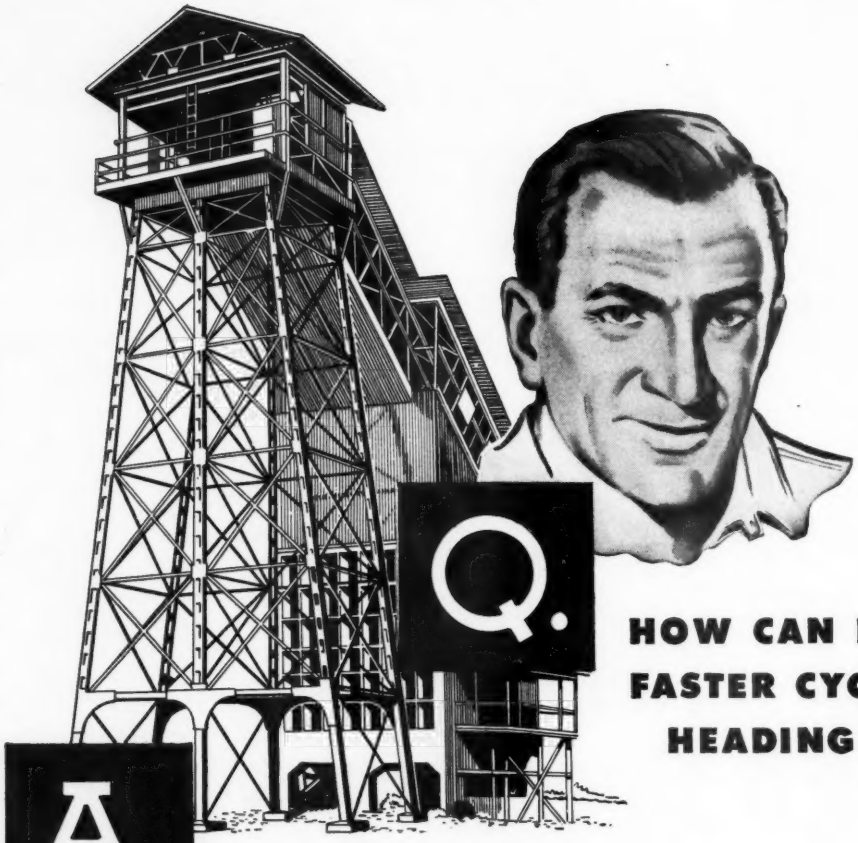
IN CANADA: JOY MANUFACTURING COMPANY (CANADA) LIMITED, GALT, ONTARIO



Q. HOW CAN I GET A FASTER CYCLE IN EVERY HEADING?

A. Let Gardner-Denver GD14 Mine Car Loaders handle the mucking. That's one good way to speed up the drilling-blasting-loading cycle in every heading. With these fast, clean-mucking loaders, you can schedule the work to keep every loader busy throughout every shift. You'll find that productivity and efficiency are increased — mining costs are lowered.

GD14 Loaders give you full-time availability — as proved by their performance in hundreds of mining installations. Gardner-Denver *master engineering* features provide speed for the job and safety for the man. Get all the facts — send today for Bulletin MCL.

Two powerful 5-cylinder radial air motors function in the GD14 crowding action to assure a full dipper every time.

USE COMPRESSED AIR FOR SAFETY CONVENIENCE FLEXIBILITY

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Opinions expressed by authors within these pages are their own, and do not necessarily represent those of the American Mining Congress

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...permits HEAVIER IMPACT

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Specify Securityflex through your Anaconda distributor (all principal cities). Anaconda Wire & Cable Company, 25 Broadway, New York 4, N. Y.

*Insist on mark of *full compliance*—P-102-BM— at 12′ intervals on any mine cable you buy.

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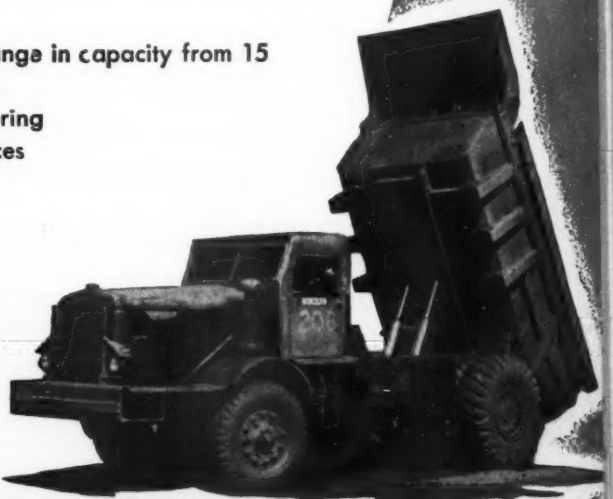
ANACONDA
from mine to consumer

SPRING MOUNTED REAR-DUMP EUCLIDS

This new line of spring mounted Rear-Dump Euclids is designed for greater speed and stability on the haul road and long life in off-the-highway service. Heavy leaf springs are free floating in spring brackets to assure smooth riding and prevent breakage caused by twisting action on rough roads. Axles are positioned to the frame by longitudinal radius rods.

Rear-Dump Euclids with spring mounted drive axles range in capacity from 15 to 34 tons . . . diesel engines to 380 horsepower . . . and have travel speeds up to 32.2 m.p.h. Hydraulic booster steering assures positive control over all road conditions and reduces driver effort on sharp turns and rough hauls.

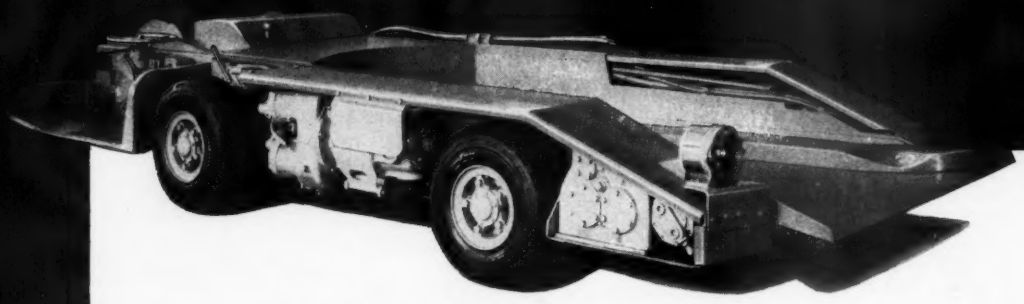


Built to the same high standards of construction and design that have made "Eucs" the favorite for tough hauling jobs, these improved models provide outstanding performance and lowest cost per ton or yard moved. Your Euclid distributor will be glad to show you how Euclid equipment can help cut your hauling costs and make more profit for you.

The EUCLID ROAD MACHINERY Co.
CLEVELAND 17, OHIO

The Coal Cutter's "HANDYMAN"

JEFFREY SHORTWALL TRUCK

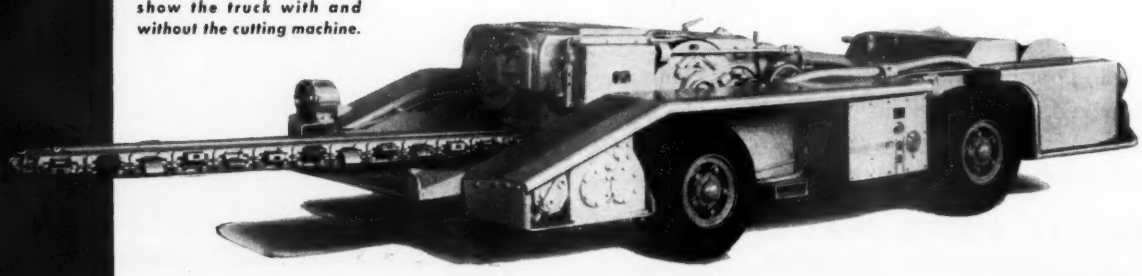


Here's a rubber-tired vehicle specifically designed for hauling SHORTWALL cutting machines in trackless mining operations. Aside from the steering this unit features full hydraulic control. Two wheel steering by steering wheel. It has a two-speed gear box with neutral and drive is by two hydraulic motors in parallel.

This truck has a tilting pan that facilitates loading and unloading the cutting machine. Machine is loaded and unloaded under its own power. Truck has a tramming speed of three miles per hour.

A truck of high utility value (can also be used for supplies) that is worthy of your consideration. Consult a Jeffrey Engineer on your cutting machine transportation problems.

The two views on this page show the truck with and without the cutting machine.



DRILLS
FANS
SHUTTLE CARS
LOCOMOTIVES
CUTTERS
FEEDERS
BLOWERS
LOADERS
CONVEYORS
JIGS

View shows a SHORTWALL coal cutter being unloaded from the truck—a roof jack is set at the face to which a handling rope (shown longside of cutter bar) is anchored and machine pulled off.

To reload, rope is anchored to pin on rear of truck tilting pan and machine is pulled on. Very simple—time is saved in moving cutter from room to room and in spotting it for cutting. Send for NEW Catalog No. 823.

The Jeffrey Manufacturing Company

Established 1877

958 North Fourth Street, Columbus 16, Ohio

Sales Offices:	Baltimore	Chicago	Denver	Jacksonville	Pittsburgh
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	Boston	Cincinnati	Houston	New York	St. Louis
	Buffalo	Detroit	Huntington	Philadelphia	Salt Lake City
Service Stations:	Birmingham	Pittsburgh	Johnstown	Scranton	Mt. Vernon, Ill.	Harlan, Ky.
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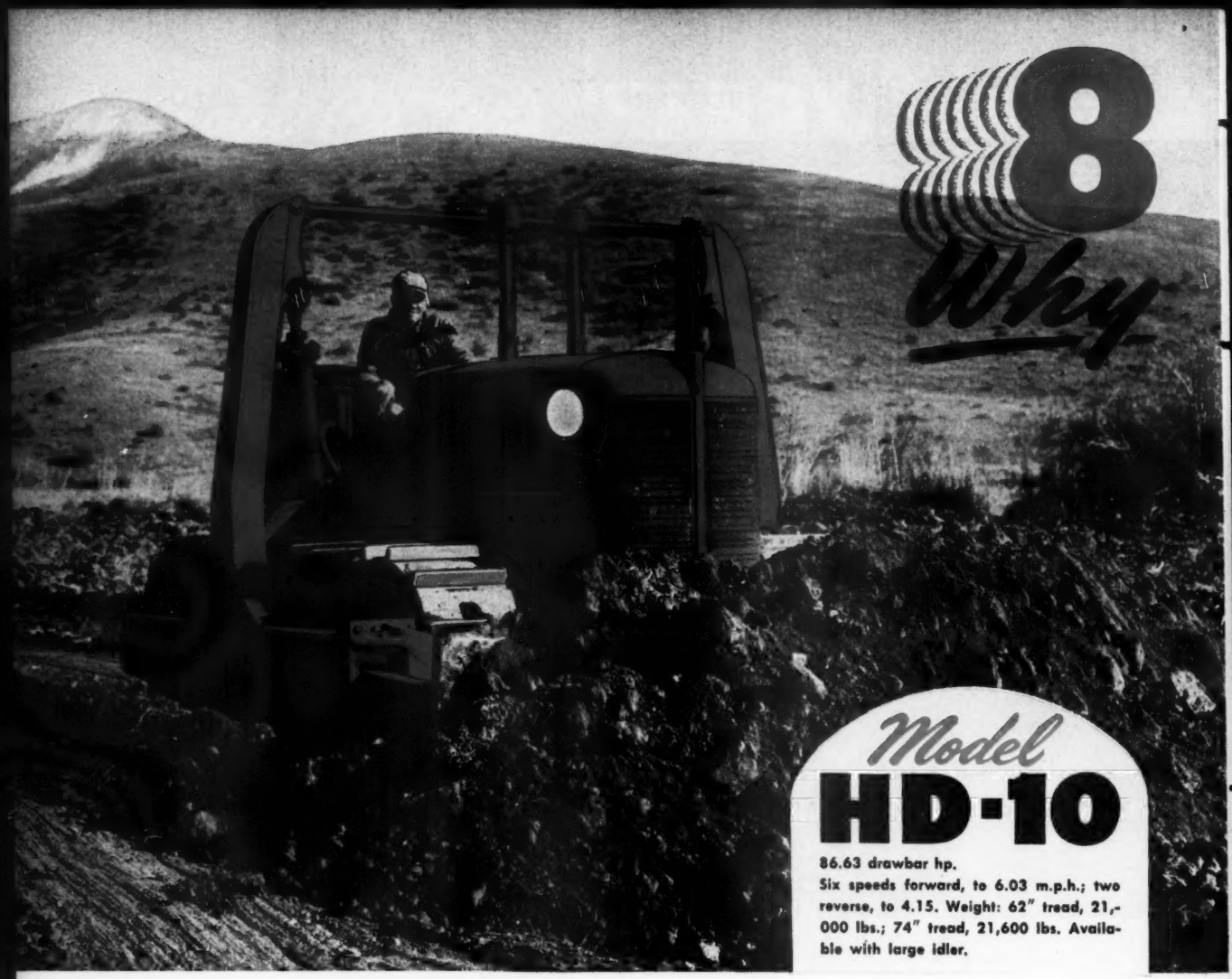
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Why
Model
HD-10
86.63 drawbar hp.
Six speeds forward, to 6.03 m.p.h.; two reverse, to 4.15. Weight: 62" tread, 21,000 lbs.; 74" tread, 21,600 lbs. Available with large idler.

Let the Outstanding Advantages of These AHEAD-OF-THE-TIME Tractors Boost Your Production and Cut Your Costs...as They Have for Thousands of Owners

1 **1,000-HOUR LUBRICATION** of truck wheels, support rollers and idlers. You operate six months on a 40-hour week basis with just *one lubrication* . . . instead of daily, or even weekly, attention. Think what this means in labor and lubricant savings . . . and in working time gained! Think of the safety factor, too—no costly damage by greasing neglect.

2 **GENERAL MOTORS 2-CYCLE DIESEL ENGINE** Rugged, simple, economical, "hanging-on" power. Smooth — every down stroke a power stroke . . . less wear and tear on tractor and operator. Far less power loss than other engines at high altitudes.

3 **INTERCHANGEABLE ENGINE PARTS** Nearly all of the GM engine wearing parts are interchangeable with each of the GM engines on the various models of A-C tractors and motor graders—no matter the size. Lowers parts investment, simplifies maintenance for Allis-Chalmers fleet owners.

4 **INSTANT STARTING** GM 2-cycle diesel engines start as easily as your automobile . . . and they *start* and *operate* on *diesel fuel.* No need to let 'em idle during work-stop periods — no unnecessary engine wear or fuel waste.

Ask any owner...or arrange for a demonstration with your Allis-Chalmers dealer ..."SEEING IS BELIEVING"

Big Reasons *they're so popular*

Model **HD-7**

60.10 drawbar hp.
Four speeds forward, to 5.00 m.p.h.; reverse to 1.89. Weight: 52" tread, 13,830 lbs.; 63" tread, 14,000 lbs. Available with large idler.

5 **FAST MANEUVERING** 2-cycle diesel tractors are well known for their fast-working ability — not only for quickly traveling from cut to fill, but for turning around instantly in their tracks . . . and for easy maneuvering in and around tight places — especially important on bulldozing. Time saved is money made!

6 **PROPER BALANCE** Weight, speed and power are positively balanced in A-C tractors, assuring top performance on every job — pulling, pushing, lifting.

7 **OPERATOR COMFORT** All these advantages mean operator satisfaction, too — resulting in more work done more easily. Besides — he has a big, wide, comfortable seat, cushioned back, arm rests, roomy platform, convenient controls, good vision.

8 **MATCHED ALLIED EQUIPMENT** Each Allied manufacturer, skilled in his own field, works in complete cooperation with Allis-Chalmers in designing and building auxiliary equipment.

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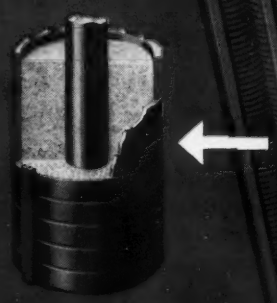
TRACTOR DIVISION • MILWAUKEE 1, U. S. A.

Originator of the Torque Converter Tractor

EXIDE-IRONCLAD PLATES *are DIFFERENT*

EXCLUSIVE Positive Plate showing slotted tube construction.



Enlarged cutaway view of section of tube containing active material. So small are the slots that, while permitting easy access of electrolyte, they retard the active material from readily washing out or forming loose.

The famous and exclusive Exide-Ironclad positive plate is the result of sixty-two years of battery-building experience. During that time we have learned much about the design and construction of every type of battery for every application. Development work never ceases in improving the performance of Exide-Ironclad Batteries. Our research staff is the largest in the industry. Engineers, chemists, metallurgists, physicists, technicians and their aides, equipped with all the necessary tools and devices, are constantly building and testing various types and kinds of plates and assemblies.

We have yet to find a positive plate with all the desirable characteristics of the Exide-Ironclad for use in mine locomotives, trammers and shuttle cars. Further proof of its superiority is supplied by long service records in thousands upon thousands of installations.

Exide-Ironclad Batteries provide high power ability, high electrical efficiency, ruggedness, long life, minimum maintenance. The combination of these Exide-Ironclad characteristics assures years of dependable day-in, day-out service . . . *at lowest cost.*

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Philadelphia 32
Exide Batteries of Canada, Limited, Toronto

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AMERICAN CYANAMID COMPANY

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Their high quality in every detail is assured by Cyanamid's intensive research, close chemical control, painstaking care in manufacture and inspection. And the AMERICAN line includes *exactly* the right explosive for every one of your blasting requirements.

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Drop Bottom Car Users Report 87% Tonnage Bonus

IF your mine is mechanized, you may be able to get out 87% more coal by switching to drop bottom mine cars. Or, to turn it around, you may be able to get out the same tonnage with 53% fewer cars!

These are not mere claims. They are actual production figures, reported by 109 mines, producing 19% of the country's underground coal from mechanized mines, and using 41,387 mine cars of all types!

Basically, there is only one reason for the higher production of drop bottom mine cars. They prevent delays at the dumping point. Drop bottom cars dump-and-return faster, eliminating wasted minutes. A trip of fourteen A.C.F Drop Bottom Mine Cars, for instance, can dump on-the-move, automatically, and be ready to return to the face... in 70 SECONDS!

Can your mine use 87% more coal hauling efficiency? Ask a nearby A.C.F Sales Representative to show you how drop bottom cars can supply a substantial tonnage bonus in your mine. American Car and Foundry Company, New York Chicago · St. Louis · Cleveland · Washington Philadelphia · San Francisco · Pittsburgh · Huntington, W. Va. · Berwick, Pa.

a.C.f. DROP BOTTOM MINE CARS

for Greater Mining Efficiency

For heavy-duty conveyors . . .

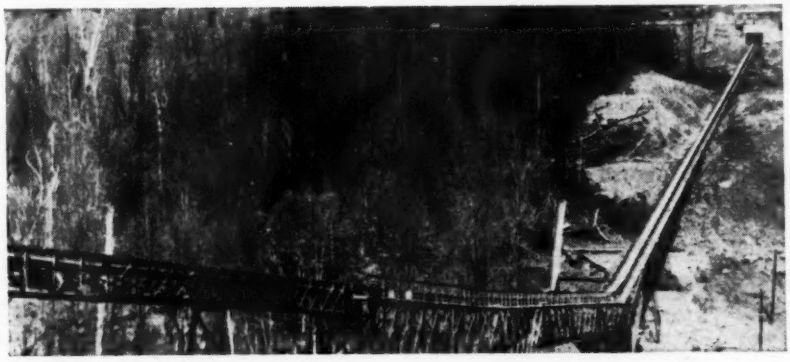
IT'S TIMKEN...

FOR over 25 years almost every heavy-duty conveyor—like most heavy duty equipment throughout industry — has relied on Timken® tapered roller bearings for long life and trouble-free performance. For example, The Blue Diamond Coal Company installed this Stephens-Adamson belt conveyor with 476 Timken bearing equipped idlers in 1930 —and at last report they haven't had to replace a bearing yet!

AND TIMKEN...

TIMKEN bearings are first choice for tough conveyor jobs like this Jeffrey Belt Conveyor installation used for long-distance sand hauling. Timken bearings provide maximum capacity for radial and thrust loads in any combination. Idlers turn freely, belt wear is reduced to a minimum. Effective seals keep lubricant *in,* dirt and moisture out. Lubrication and maintenance time is negligible.

AND TIMKEN® AGAIN!



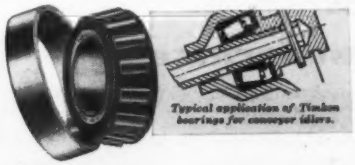
AND here's one of the latest Timken-equipped jobs—a 1,485 foot Robins conveyor at The Gauley Mountain Coal Company's Williams River Mine. It's another addition to the thousands of miles of heavy-duty conveyors that roll on Timken bearings. There's no other bearing with so much to offer, no other bearing so fully proved. The Timken Roller Bearing Company, Canton 6, Ohio. Cable address: "TIMROSCO".

Whenever the going's tough industry turns to

TIMKEN

TRADE MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS



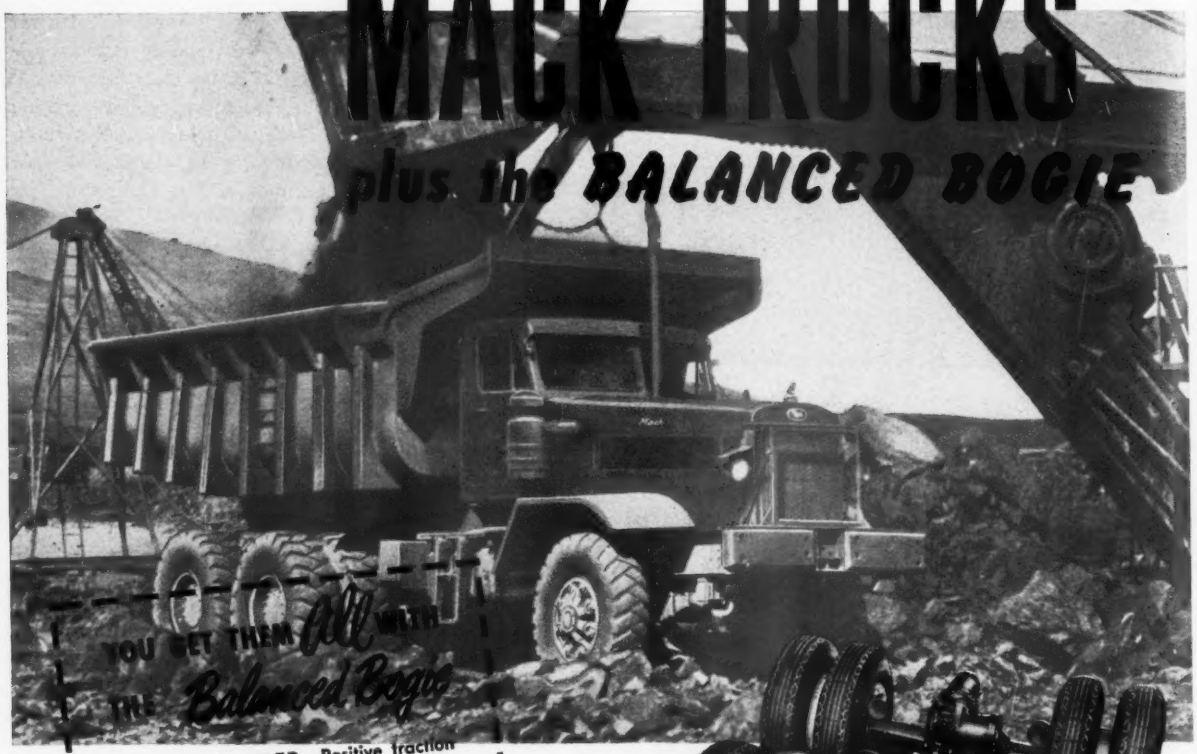
Typical application of Timken bearings for conveyor idlers.

NOT JUST A BALL ○ NOT JUST A ROLLER ▭ THE TIMKEN TAPERED ROLLER ▭ BEARING TAKES RADIAL ◎ AND THRUST →◎← LOADS OR ANY COMBINATION →✳←

a Profit-Winning Combination

MACK TRUCKS

plus the BALANCED BOGIE



POWER DIVIDER: Positive traction regardless of terrain

INTER-AXLE DIFFERENTIAL: No wind-up or overstress of driving parts

RUBBER SHOCK INSULATORS: No spring twist . . . no lubrication

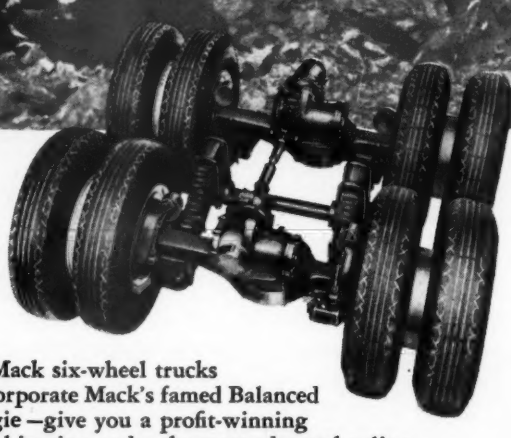
MAXIMUM FLEXIBILITY: No chassis distortion

SELF STEERING: No tire scuffing

UNIFORM TIRE LOADING: Longer tire life

UNIFORM BRAKING: Better control
No weight transfer between axles
No bogie hopping, rearing or toe-stubbing

SIMPLICITY OF DESIGN: Achieves minimum maintenance



• Mack six-wheel trucks incorporate Mack's famed Balanced Bogie—give you a profit-winning combination under the most adverse hauling conditions. Here is no makeshift assembly—but a bogie that is a component and integral part of the complete truck unit.

No other trucks—for operation on or off the highway—offer you all the outstanding advantages you get with the Balanced Bogie in Mack six-wheelers.

Check them for yourself. They're your assurance of trouble-free, uninterrupted schedules; lower costs and increased profits. For the full story, see your nearest Mack branch or distributor.

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modernize with

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outlasts them all

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BELTING BUILT FOR THE TOUGH JOBS

HEWITT-ROBINS Conveyor Belting gives longer service at less cost

When trouble comes by the ton . . . especially when it's a heavy abrasive like coal . . . the easiest, most dependable and most economical way to move it is on a Hewitt-Robins conveyor belt.

For over half a century, the Hewitt Rubber Division of Hewitt-Robins Inc. has pioneered in making the right belt for every conveyor installation. Today, engineers the world over instinctively specify Maltese Cross® where the going is really tough, Ajax® for general service, and Conservo® for lighter applications and portable conveyors.

In Hewitt Rubber belting they get full protection against moisture, oils, flexing and ply-separation, as well as treatment against mildew. They get abrasions-resistance from extra-tough rubber covers, heavily textile-reinforced for maximum strength plus flexibility.

Engineers turn to Hewitt-Robins not only for belting but for entire belt conveyor systems. They know Hewitt-Robins is *the only firm able to accept complete responsibility.* For belting, address Hewitt Rubber Division, Buffalo 5, N. Y.; for machinery, Robins Conveyors Division, Passaic, N. J.; for engineering services, Robins Engineers Division, 157 Chambers Street, New York, N. Y.

HEWITT-ROBINS

CONVEYOR BELTING

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Photo courtesy of The United Electric Coal Companies

Today many coal buyers "write their own prescriptions." In ordering coal from the mines, they specify not only grade and size, but also carbon content, sulphur content, volatile matter, and *heat* value as well—in order to get exactly the kind that burns most efficiently in their equipment.

Quality control laboratories, like the one pictured above, make this possible. They are located right at the preparation plants of modern, mechanized coal mines. Here technicians check bulk samples—weighing, burning and analyzing each one. Their "lab" reports enable preparation plant superintendents to deliver the right coal to each customer.

Such scientific steps are only part of modern coal mining, which also includes million-dollar preparation plants, electric-powered shuttle cars, and high-speed conveyor belts, *plus* machines that drill, cut, dig and load coal. All these are the result of a far-sighted program of capital investment in mechanization that has made America's coal mines the safest, most efficient and productive in the world.

Working conditions in modern coal mines are far different in many ways than you may have thought. Today the miner scarcely touches pick or shovel. Indeed, he's a skilled operator of many specialized machines—like mobile power drills, cutters, loaders, shuttle cars, and high-speed conveyors. He works in clean, fresh air, too. In fact, *more* tons of fresh air are pumped into today's modern mines by giant fans each 24 hours, than tons of coal moved out. And for his work, the miner earns higher average hourly wages than are paid by any other major industry.

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Now for the first time coal mine mechanization has a 4-ply belt with all the ruggedness and fastener-holding ability of United States Rubber Company's 4-ply 42 oz., with *increased crosswise flexibility*. Now for the first time all the desirable features of an underground belt are incorporated in *one* type of construction.

Style XN has a working tension strong enough to satisfy the requirements of all but a few of today's installations. Style YN incorporates the additional strength required by extremely long center installations in use or contemplated.

Outstanding features of this remarkable belting include: OPTIMUM CROSSWISE FLEXIBILITY, providing excellent troughing and easy training, eliminating edge wear and spillage. CROSSWISE STRENGTH, to resist gouging and tearing. ONE-TYPE FABRIC CONSTRUCTION, to equalize tension and elongation throughout the belt. ELASTICITY, to cushion shock loads and impact, prevent localized strain. FASTENER HOLDING STRENGTH comparable to United States Rubber Company's 4-ply 42 oz., which hitherto has been considered outstanding in this respect.

For more information write Mechanical Goods Division, United States Rubber Company, Rockefeller Center, New York 20, N. Y.

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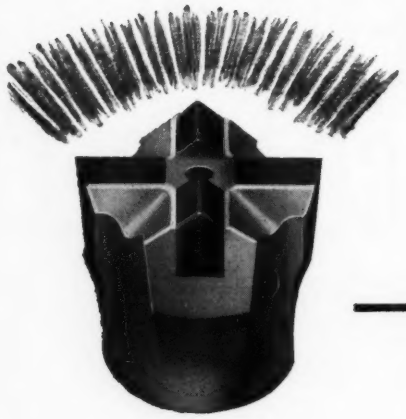
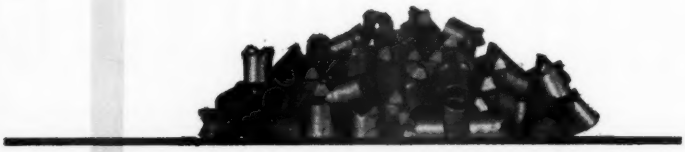
One CARSET JACKBIT does the work of more than 100 steel bit uses





CARSET ADVANTAGES

- Practically eliminates bit changes
- Drills longer steel changes without binding
- Saves up to 30% on dynamite

These are the proven facts about CARSET JACKBIT performance and economy—based on thousands of actual field reports like those given below.

In nearly all cases CARSET JACKBITS have drilled *at least* 100 times as much hole footage as a steel bit usage — in many cases, 300 or 400 times as much. The footage that you can drill with one CARSET JACKBIT would therefore require 100 bit changes if steel bits were used. And because gauge-wear is negligible, even in abrasive rock, CARSET JACKBITS can drill the longest practical steel changes without binding. They drill uniform-diameter holes to any practical depth, saving up to 30% on dynamite costs alone.

But this is only part of the story. For full information on CARSET JACKBITS — what they have done for others, and what they can do for you, write today for your copy of catalog No. *4091.*

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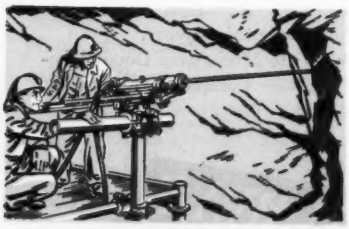

A MINING COMPANY, driving a 12 by 20 foot, 97-hole heading in hard taconite, pulled 6½-foot rounds in 18.5 hours with CARSET JACKBITS, compared to 5-foot rounds in 49.8 hours with steel bits. Actual cost with steel bits was $142.56 per foot of drift. With CARSET JACKBITS, the cost was $49.77 per foot — a saving of $602.48 per round!

ON A LARGE ROAD JOB, a contractor used 125 CARSET JACKBITS. His total cost for bits and rods was $2,008. He estimates, that with steel bits, his bit and rod cost would have been at least $7,500! His saving on bit and rod cost alone, therefore, amounted to $5,492 — about $43.00 for each CARSET JACKBIT used.

A CONTRACTOR on a large sewer project, drilling with J-50 Jackhamers in hard, dense basalt, was able to average only one foot of hole per steel bit, at a bit cost of approximately 15 cents per foot of hole. Now, with CARSET JACKBITS, he is averaging 260 feet per bit, at a bit cost of 5¼ cents per foot of hole — a saving of 66% on *bit costs alone.*

Stops throw-off on dipperstick gears!

LUBRICANT throw-off from dipperstick gears on the shovel shown above brought trouble and expense to the Landrey Mining Company of Winslow, Indiana. The gears had to be greased once or twice each shift. This took time and labor, consumed lubricant by the pound.

A Standard Oil lubrication specialist persuaded company officials to try one of the Calumet Viscous Lubricants—No. 10X.

The results are reported by Ralph A. Landrey, president of the company. "After the first application, no additional lubrication was needed after one full week of operation. However, we added some lubricant because it seemed impossible that there could be any left on the gears. At the present time, we add Calumet Viscous Lubricant No. 10X about every three weeks. *We have not only extended gear life but have made a considerable saving in the amount of lubricant and in the labor required for application.*"

Savings such as these have been brought to a host of midwest mines by Standard Oil's lubrication engineering service and high-quality products. How these service and product advantages can help you is explained at the right.

CALUMET VISCOUS LUBRICANTS

What's YOUR problem?

Oscar Daussman, lubrication specialist at Standard Oil's Evansville, Indiana, office solved the Landrey Mining Company's problem because he was thoroughly familiar both with the qualifications of his products and with the requirements of the job. He applied the lubricant that exactly met the customer's needs.

There is a corps of such lubrication specialists throughout the Midwest who are trained and experienced to help mine and plant operators solve similar problems. Experience enables these men to find quickly the cause of lubricating trouble. Knowledge of petroleum products enables them to prescribe the lubricant needed. There is one of these lubrication specialists at the Standard Oil Company (Indiana) office near you. He is there to serve you. A call or card will put him at your service.

Investigate the cost-cutting possibilities of these lubricants

STANOIL INDUSTRIAL OILS

Here's one line of oils that provides cleaner operation of loader and crane hydraulic units, supplies effective lubrication in compressors, gear cases, and circulating systems. One or two grades can replace a wide variety of special oils and lubricants

SUPERLA MINE LUBRICANTS

This new, improved line of oils and greases provides better lubrication of cutters, loaders, locomotives, mine cars, and other underground equipment. They eliminate transmission-case deposits, reduce clutch-plate gumming, and minimize wear on gears and bearings.

CALUMET VISCOUS LUBRICANTS

On open gears and wire rope, these greases strongly resist washing and throw-off. Their superior wetting ability affords better coating of gears and better internal lubrication of wire rope.

STANDARD OIL COMPANY (INDIANA) STANDARD

announcing

the CP Light Wagon Drill

Here's a new aid to faster drilling, the G-150 *Light* Wagon Drill. With it and the new 59-pound CP Sinker, or the 3-inch CP Drifter, you can increase footage in benching or toe-holing up to 100% over hand-held methods. 6-foot steel changes materially increase actual throttle time.

A new, compact, cone gear drive—exclusive with CP—has 66% more tooth contact than conventional worm gearing. This design insures longer life because of greater load carrying capacity.

Holes are drilled easily at any angle. Positive, uniform feeding pressure insures faster unit drilling speed with lower air consumption per foot drilled. Powered steel puller avoids wrenching of steel and loss of holes in bad drilling ground.

Write for Bulletin SP-3010 giving specifications in detail.

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General Offices: 8 East 44th Street, New York 17, N. Y.

PNEUMATIC TOOLS • AIR COMPRESSORS • ELECTRIC TOOLS • DIESEL ENGINES
ROCK DRILLS • HYDRAULIC TOOLS • VACUUM PUMPS • AVIATION ACCESSORIES

A Modern Pioneer for New Frontiers

In expanding the coal-stripping frontiers and searching for more economical means of uncovering coal at increasing depths, many mine owners have found the ideal solution in Bucyrus-Erie walking draglines — like the 8 to 10 cubic yard 450-W shown working in a Kentucky mine. The 450-W swings booms 165 to 200 feet long, digs as deep as 130 feet . . . can dump material a maximum 412 feet from digging point. It offers unusual stability, easy accurate control and carefully balanced power for a fast cycle that boosts production. Its simple, reliable walking mechanism carries the 450-W safely, surely over soft, loose or wet ground without destructive jars or shocks, and the entire machine is simply designed and ruggedly built for a lifetime of dependable service with low maintenance costs. We will be happy to supply full information on the 450-W and other walking draglines in the outstanding Bucyrus-Erie line.

90L50

BUCYRUS ERIE

SOUTH MILWAUKEE, WISCONSIN

Champion OF 'EM ALL!

When the International TD-24 climbs into the production ring, its power plus features found in no other crawler, pay off in dollars. The champion packs the winning punch when the going is toughest.

J. H. Beers of Bangor, Pa., found that his TD-24 does the work of two competitive big tractors. This TD-24 works with a big shovel in strip mining operations and according to Beers pushes from 7 to 12 yards at a time—bigger blade loads than even the TD-24's claimed capacity. The big champion also cleared a tough 200-foot hillside road in half an hour while performing its road building duties.

Seeing is believing. Let your International Industrial Power Distributor demonstrate the TD-24 and see for yourself how the champion performs. Cash in now on the power of the "Champ." Put it to work for you and watch it deliver dollars from more work done.

INTERNATIONAL HARVESTER COMPANY
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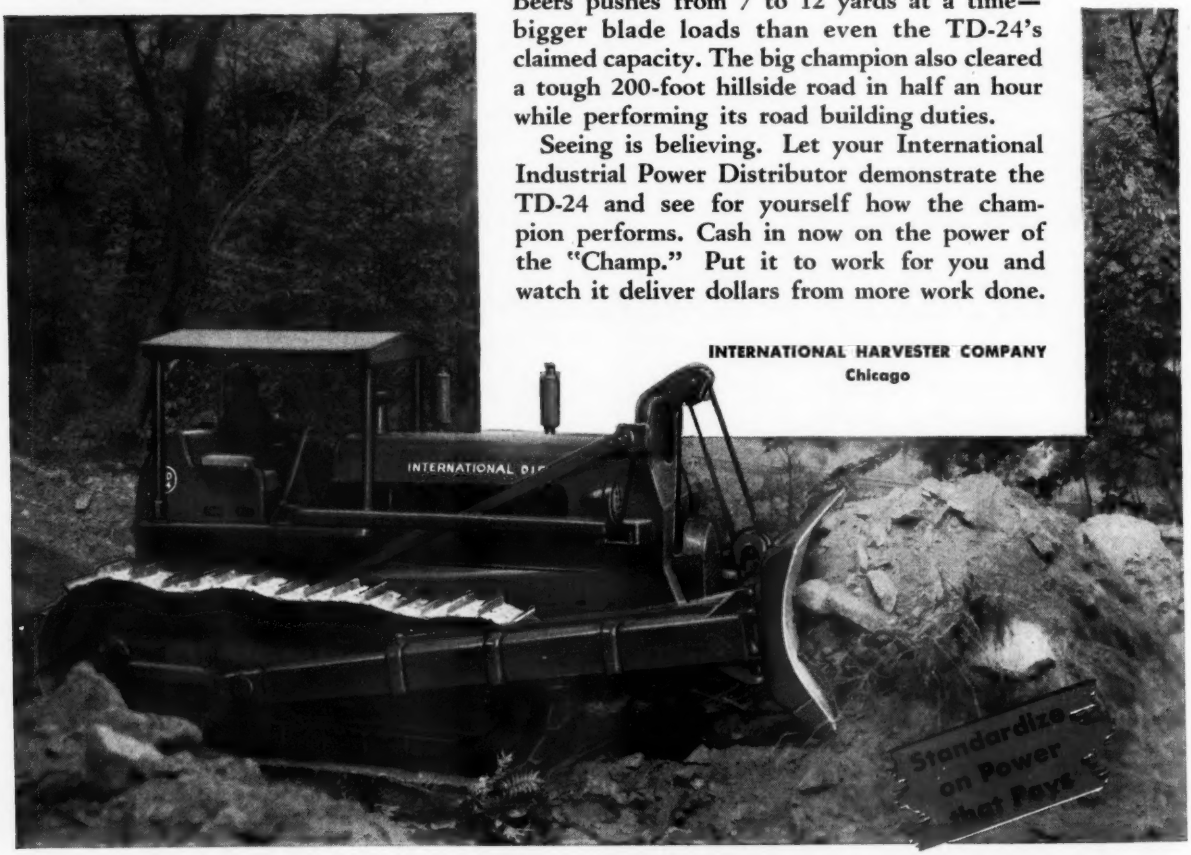

CRAWLER TRACTORS
WHEEL TRACTORS
DIESEL ENGINES
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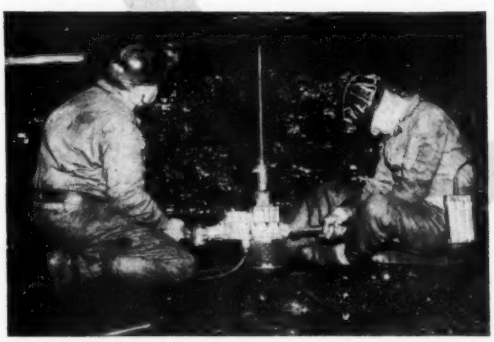
"KENNAMETAL INSERTS TAKE UP TO 100 TIMES MORE SURFACE WEAR, GIVE MANY REGRINDS"

"TOUGH BODY CONSTRUCTION FOR LONGER LIFE, LOWER COST"

"SUPERIOR KENNAMETAL EDGE THAT GIVES 20% FASTER DRILLING"

"UNIFORM PRONG TAPER FOR FREE, EASY DRILLING"



Kennametal RD Bit for Drilling Bolt Holes

Here is another of Kennametal's pace-setting drill bit developments that offers you unprecedented advantages for more speed and lower cost. It is the only cemented carbide rotary drill bit built exclusively for drilling bolt holes in hard boney, hard slate, and hard shale.

You save the cost of extra drills . . . as illustrated, your present electric drills will do the job. Compressor cost, air hose cost, stoper cost are eliminated. For fast drilling there is no equal.

Your Kennametal representative will not only be glad to demonstrate the Kennametal line of rotary drill bits (see FD style for more difficult drilling) but he will also be glad to suggest many helpful ways to mount your drills to use them! This can mean a tremendous saving in your roof bolting plans. Contact the representative near you today or write Mining Division, Kennametal Inc., Latrobe, Pa.

Other Kennametal Bits used for drilling bolt holes

STYLE FD

drills laminated sandstone

STYLE PAF

drills massive sandstone and hard limestone

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Please send free booklets checked below:

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- ☐ Kennametal Bits for Bolt Hole Drilling
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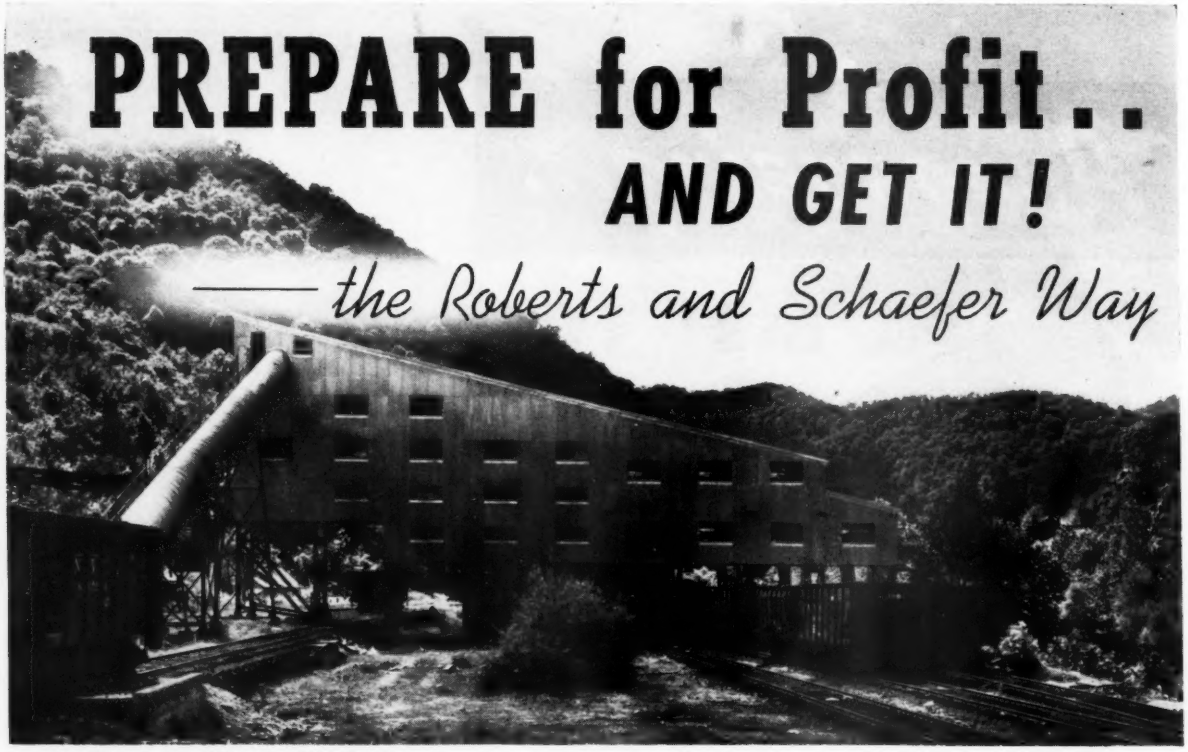
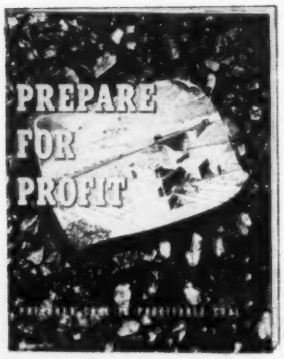
CLIP THIS COUPON — mail for particulars today!

PREPARE for Profit..
AND GET IT!
—the Roberts and Schaefer Way



Mammoth Washery, Warner Collieries Co.
Mammoth, W. Va.

Peter's Creek Coal Co., Summersville, W. Va.



A short note on your company letterhead will bring you a copy of the new 20-page booklet, PREPARE FOR PROFIT . . . featuring stories of how other plants are solving their preparation problems the R*and*S way. Write today—your copy will be forwarded immediately.

IN PENNSYLVANIA, ALABAMA, WEST VIRGINIA . . . wherever coal is prepared, there you'll hear stories of R*and*S success. There, you'll find testimonials to the functional design and operating efficiency of Roberts and Schaefer Coal Preparation Plants.

Why?

Because Roberts and Schaefer Preparation Plants are engineered and constructed to solve each individual problem . . . produce premium coal at premium prices . . . operate to their owners' complete satisfaction and greatest profit. In one short sentence: R*and*S-engineered plants do the job they are intended to do. And when you consider the 40-odd years of R*and*S experience that go into their planning and construction—you *know* that success is inevitable.

But look at your own plant, and ask yourself these three questions: Does it measure up to increasing competitive pressure? Is it still producing regular-price coal while competition is getting premium prices? Are the benefits of modern mining methods being lost because your plant is obsolete? If you have any doubts concerning any of these fundamental questions, it's worth talking about . . . with experts. R*and*S engineers invite you and your problems—and there's no obligation.

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Mining CONGRESS JOURNAL

Published for the Entire Mining Industry
by the AMERICAN MINING CONGRESS
SHELDON P. WIMPFEN, Editor

VOLUME 36 FEBRUARY, 1950 NUMBER 2

Tomorrow's Face

EMINENT members of the mining profession review the most important phases of the coal, metal and nonmetallic mining industry in this Annual Review. On the basis of past achievements and current activities, they also, in many cases, project their thoughts into time to appraise the future.

In 1949 domestic production totaled 13.9 billion dollars in metals and minerals, including fuels. In terms of dollar value this was second only to the record output of 1948.

Repeated strikes were the principal factor in reducing bituminous coal output to an estimated 430,000,000 tons. Strike-bound anthracite production declined to 43,000,000 tons, the lowest since 1902.

Iron ore shipments dipped an estimated 16 percent, the result of a widespread steel strike. Ferroalloy shipments slumped 29 percent from 1948 because of curtailed steel output and reduced demand; manganese, tungsten and molybdenum shipments falling 12, 20 and 22 percent, respectively.

The tonnage of copper produced from domestic mines was 11 percent lower than in 1948. Zinc output dropped 12 percent while lead production increased 3 percent.

A 4 percent decline in gold output was mainly due to decreased by-product production from nonferrous mines closed by low metal prices. Silver production declined 11 percent primarily because of strikes.

Mercury output plummetted to the lowest point in a century of record keeping.

In the field of the light metals, aluminum production was adversely affected by strikes. Magnesium output increased. Advances were made in the commercial production of titanium and titanium alloys.

Nonmetallic minerals, on the whole, fared well, with heavy demand for construction materials, fertilizers, sulphur, salt and lime.

Looking at these data, the present picture is not too unpleasant. But for the domestic mining industry to achieve a rate of growth consistent with current trends towards increased population and higher per capita demand for the products of our mines, we must take a long, close look at the road ahead.

As pointed out at this time last year, capital expenditures for 1948 were three-quarters of a billion dollars. A like sum was spent in 1949. In 1950, however, the mining industry plans expenditures for new plant and equipment estimated at only $620,000,000, a cut of 17 percent.

This is an ominous reduction in spending for new facilities to supply our mineral requirements. It reflects a downturn in industry's confidence in the future. Although alternating periods of high and low consumption of minerals do occur, the long-term trend is towards increased use. And, in view of the long time lapse between discovery of a mineral resource and the date when a mine is placed on a producing basis, the mining industry must take a long-range outlook in laying its plans to fulfill raw material demands.

If we are to meet this Nation's growing raw material needs, definite encouragement of the domestic mining industry, through just tax treatment, is a prime requisite. If Congress fails to give this vital problem the serious consideration warranted, we may anticipate a decline from our present dominant position in world affairs and in our standard of living.

Of all proposals designed to provide incentive to take the risks of searching for new deposits and developing new mines, the one that has always worked is *profit*. Reduce profit to a point where the *net after taxes* from a successful venture is not commensurate with the risks, and mineral raw materials in adequate quantity will not be forthcoming. Domestic mining, in general, might well follow in the faltering footsteps of mercury mining.

The disaster that would follow progressive curtailment of mining operations induced by an oppressive tax climate can be avoided. We shall not avoid it by unwarranted attacks upon the moderate depletion allowances that now enable the mine operator to recover, at least in part, the capital value of his mineral deposits. Rather, we should revise some of those features of the tax structure that now act as deterrents to mining investment and the exploration and development of new mineral reserves.

The National Minerals Advisory Council, appointed by the Department of the Interior as being representative of all segments of the minerals industry, including small, medium and large operators, has recently given intensive study to this problem and has stated in clear and positive form certain tax changes called for in the National interest. These are set forth on page 99 of this issue. We earnestly commend them to the attention of our readers and to those who have the responsibility for National tax policy.

Administrative indifference has brought us to the point where tomorrow's face becomes apparent. Corrective measures are urgently needed now if we would avoid a tax-fabricated mineral shortage in the decades ahead.

Annual MINING

Atomic Energy and

★ ★ ★

In the February 1949 issue of Mining Congress Journal, the article on Atomic Energy Minerals discussed the vitally important role of the domestic mining industry in the field of atomic energy. This article reviews some of the significant developments of 1949.

A recent item, received after preparation of this paper, announced discovery of uranium deposits in upper Michigan by the Jones & Laughlin Ore Corp. The radioactive material has been identified as uranium oxide in the form of pitchblende and exploration will be carried out to determine if the find has economic importance.

★ ★ ★

ON four related fronts, the problem of domestic uranium resources is being attacked, jointly, by private enterprise and the government: production from known deposits; exploration for new deposits; investigation of the origins and geological associations of radioactive ores; and research concerning methods of ore treatment.

Particularly in the case of production, where the government depends largely on private enterprise for results, and in exploration as well, the active participation of the mining community is indispensable. In spite of government direction of the atomic energy program, it is the hope of the Atomic Energy Commission that exploration for uranium, development of uranium mines, and production of uranium ores, concentrates and refined products will be considered by the mining industry in the same manner as their normal activities directed toward the recovery of other metals under the stimulus of the profit motive. The policy and program of Raw Materials Operations have been formulated with the view of implementing this hope.

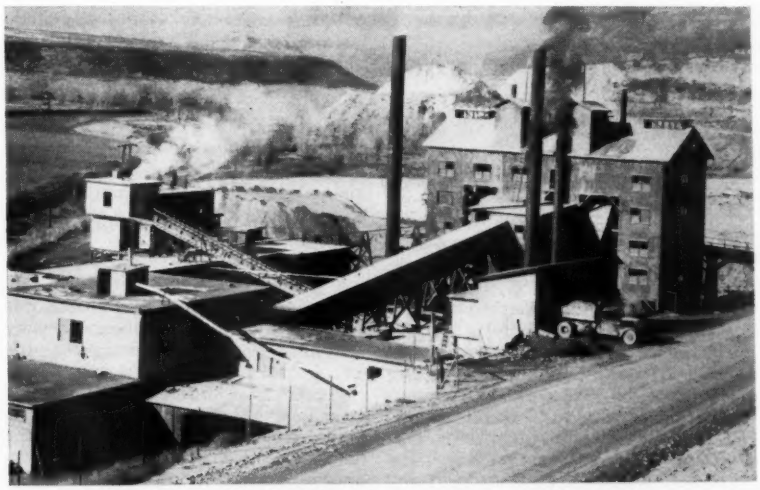
During 1949, the carnotite ores of the Colorado plateau continued to be virtually the only source of domestic uranium production. Wartime operations had practically ceased by 1946 and production was not resumed to any extent until the spring of 1948 when the Commission announced its domestic uranium program. Since then exploration, mining and processing operations have rapidly expanded. In March 1948 there were only eight mines producing uranium-vanadium ores on the plateau but by the end of 1949 approximately 160 mines were in operation. During the same period employment in mining operations rose from 80 to nearly 700. Because of the size of the ore bodies, most of the individual operations are small, even those of the larger companies. The more important producers include the U. S. Vanadium Corp., Vanadium Corporation of America, Minerals Engineering Co. and Sitton and Dulaney, Inc. In addition, there are a large number of small operators who own or lease properties.

Some years ago the U. S. Vanadium Corp. and the Vanadium Corporation of America acquired mining properties and constructed mills for the purpose of obtaining vanadium. Additional facilities have been added and new

REVIEW

the Mining Industry

processes employed to recover uranium. The Vanadium Corporation of America is now operating plants at Naturita and Durango, Colo., and the U. S. Vanadium Corp. has plants at Rifle and Uravan, Colo. A fifth plant at Monticello, Utah, is owned by the Commission and is operated by The Galigher Co. of Salt Lake City. Only the Rifle and Naturita plants were operating in 1948. The Monticello and Durango mills were rehabilitated and put into operation in 1949 and the plant at Uravan will be in opera-



Rifle plant of U. S. Vanadium Co. treats company and custom ores

•

On these pages, 31 to 125, outstanding authorities in their respective segments of the mining industry review the activities and the progress made in 1949. Trends are noted that may indicate the direction of future developments.

Mining Congress Journal is deeply appreciative of the splendid cooperation extended by the authors of this Annual Review and takes real pleasure in bringing their thoughts to the attention of the entire mining industry.

•

tion at the beginning of 1950. In addition, the Vanadium Corporation of America is operating a small experimental plant, designed to treat copper-uranium ores of the White Canyon district of southeastern Utah, at Hite, Utah. All company-operated mills purchase ore from independent producers in addition to processing their own ore. The Commission-owned plant at Monticello, Utah, operates entirely on custom ores, the purchase and sampling being handled by the American Smelting and Refining Co.

Exploration at High Level

The hope of locating a large deposit of high-grade pitchblende ore is, of course, always present in the Commission's exploration activities, and in 1948 a ten-year guaranteed minimum price for high-grade ores was established to encourage search. However, the Commission recognizes that it is also urgently important to push as vigorously as possible the search for and understanding of other lower grade domestic sources of uranium and to expand knowledge of presently-known low grade deposits.

Jointly the U. S. Atomic Energy Commission and the U. S. Geological Survey are conducting drilling programs, chiefly in the Colorado plateau area. As of September 30, 1949, a total of 3570 holes had been drilled under these programs, for a total footage of 328,000 ft; 200,000 ft of core had been examined, and 1520 holes had been logged radiometrically. The purpose of the drilling programs on the plateau is to establish the presence of ore bodies and thereby encourage development and mining by private initiative. As favorable areas are determined, the lands on which they occur are made available to private operators for further drilling development and mining.

A second objective of this exploration program is to develop reliable ore-finding criteria that will facilitate future exploration work. The program includes aerial mapping, using both ground surveys and aerial photographs, together with various geological, mineralogical, geophysical, geochemical and geobotanical studies. At the end of September 1949, 3860 sq miles had been mapped, 175 reports dealing with specific areas and subjects had been prepared, and more than 37,000 samples had been examined. A further project, involving the study of certain types of low grade ores, other than the typical carnotites, is also under way throughout the southwest adjacent to the Colorado plateau.

Active exploration is not confined to the Colorado plateau and adjacent areas. Many companies have purchased Geiger counters and are examining their mine workings and tailings piles to determine whether they contain uranium that could be profitably extracted. Similar investigations of mines, mills and smelters are being conducted by the U. S. Geological Survey and the Commission. Field studies of the Colorado Front Range, from which small amounts of pitchblende were produced in the early 1900's, are also being conducted by the Geological Survey. Other investigations are completed or in process, such as studies of schroeckingerite deposits in Wyoming, black shales in Tennessee, primary vein deposits in northern Michigan and Minnesota, and the known mineralized areas of Alaska, as well as general reconnaissance throughout the United States.

For the past year and a half, the Geological Survey has carried on a program of inspection of gamma-ray logs of oil and gas wells throughout the country, as a possible means of identifying deeply-buried formations that may be of higher than normal radioactivity. Samples of interesting strata are being obtained from the petroleum industry.

The most recent new find of a primary uranium deposit in the United States was the discovery in July 1949 of pitchblende near Kellogg, Idaho, in the south-central part of the Coeur d'Alene mining district. Although the district has long been known for its rich silver, lead and zinc veins, there had been no prior reports of radioactivity in the region and a brief radiometric reconnaissance of the area had been planned purely on the basis of geologic possibility. The discovery was made by a Commission geologist in the Sunshine mine. Pitchblende was found in silver-rich stringers of pyrite, siderite, and tetrahedrite. Development work by the Sunshine Mining Co. to evaluate the potential importance of this occurrence is under way, and beneficiation studies have been undertaken by the Massachusetts Institute of Technology. Further exploration in the district as a whole is also under way, by both government and company geologists.

Geological Research Needed

All information provided by the exploration activities described above is available for use in the broader programs of research concerning uranium ores that are being conducted by the U. S. Geological Survey, by the Atomic Energy Commission, and by universities or university personnel as Commission contractors.

The need for such theoretical studies is great. In the course of many years of exploration and mining, a considerable fund of knowledge has been assembled concerning ores of other valuable minerals. But with respect to uranium ores, many fundamental geological and mineralogical questions remain unanswered. In what types of deposit is uranium most likely to be found? Are there other minerals that may be used as uranium indicators? Can any generalizations be made about the paragenesis of primary uranium deposits? Are there any reliable criteria that may indicate the proximity of uranium ore? Complete and reliable answers to such questions are not available even for pitchblende, the most important uranium mineral. Research studies dealing with the geology and mineralogy of uranium are therefore extremely important in the understanding of uranium resources.

To aid in solving the mineralogical problems of the copper-uranium deposits of Utah and Arizona, a thorough program of mineralogical research is being conducted at the University of Minnesota under a contract with the Commission. Laboratory reseach on the mineralogy of the vein deposits of the Colorado Front Range, the Coeur d'Alene district and noted pitchblende deposits throughout the world is being conducted for the Commission at Columbia University.

Private individuals, private industry, government agencies and universities are also attempting to improve present instruments and to develop new ones for the detection of radioactivity in the field and in the laboratory.

Ore Treatment Research

As in the case with most metals, low grade uranium deposits, not commercially valuable with presently-known methods of extraction, are plentiful as compared with high grade deposits. Improved methods of ore beneficiation would, therefore, greatly increase the amount of domestic uranium available. Hence, the Commission has initiated a comprehensive experimental program designed to investigate the feasibility of working these low grade sources. Supplementing the field studies of phosphates, shales and other low grade, uranium-bearing formations mentioned in the preceding section, several private laboratories, operating under contracts with the Commission, are studying possible methods of recovering from such deposits the small percentage of uranium that they contain.

World-Wide Search

Intense interest in the search for the raw materials of atomic energy continues to grow throughout the world. During 1949, newspapers carried reports of hundreds of discoveries of radioactive ores in many countries. Some degree of national control or aid in atomic development now exists, or is reported to exist, in 34 countries. Many of them control or prohibit the

export of radioactive material. Among the more important developments reported from abroad during the past year are the following:

In Mexico, a decree was issued in 1946 incorporating all radioactive elements into the national mineral reserves and requiring also that discoveries of raw materials be reported to the secretary of national economy. Plans are said to be under way for the government to begin developing its known uranium deposits in 1950. In March 1949 Great Britain announced a ten-year guaranteed minimum price for uranium ores and concentrates produced in the empire. In some cases financing may be provided for exploration and development of uranium deposits and concentration of the ores. The atomic energy commission set up by the French government is said to be developing uranium ores in France and in colonial areas, with active prospecting for uranium under way.

Norway plans a uranium survey of the entire country, and numerous reports in the Norwegian press during 1949 described the mining activity taking place in the pitchblende-bearing pegmatites in Evje. Press reports from Sweden have referred to a newly-developed method of extracting uranium from alum shale. Reports continue to appear of intense mining activity in the Soviet zone of Germany, in Czechoslovakia and in Poland.

The government of Egypt is said to have plans for importing experts to search for uranium deposits, and Syria is reported to have granted licenses to petroleum companies to prospect for uranium. In India, the government has entered into a 15-year agreement with two French companies, to process the Travancore monazite sands for thorium and rare earths. Australia has set up a schedule of rewards for the discovery of uranium deposits capable of producing at least 25 tons of uranium oxide.

At a conference held in London in September 1949, scientists from the United States, Great Britain and Canada discussed problems of common interest concerning exploration for uranium, and talks concerning the production of uranium from Rand gold ores took place in Johannesburg, South Africa, in November 1949, among officials of the United States, South African and British governments.

Domestic Uranium Program

The preceding section gives some indication of the intense interest shown by many foreign countries in seaching for and developing their sources of radioactive raw materials, in order to promote their various atomic energy programs successfully. It is the obligation of the Atomic Energy Commission to lead the world in atomic energy development, and it is the intention of Raw Materials Operations to assure that there will be no raw material supply bottleneck. Accordingly, the Commission launched its Domestic Uranium Program early in 1948 to promote the discovery and development of uranium deposits by private enterprise. The Program includes a ten-year guaranteed minimum price for uranium ores and concentrates of specified grades and in specified quantities; a bonus of $10,000 (in addition to the price paid for the ore) for discovery and production of high grade ores and concentrates from new deposits; and special provisions applying to ores from the Colorado plateau area. The program has been discussed in the press and in speeches before professional groups and others by Commission officials. More than two dozen magazines, some of them in specialized fields and others of general nation-wide circulation, have published feature articles concerning the Uranium Program. Many hundreds of newspaper items have also appeared describing the program, or reporting supposed new discoveries of uranium.

Although at the time of writing this article no individual or company has qualified for the $10,000 bonus, response to the Domestic Uranium Program by the general public and by mining companies has been encouraging. During the first 18 months of the program's operation (April 1948 through September 1949) more than 10,000 inquiries concerning the program were made in person or by letter, and more than 12,000 samples were submitted to be tested for radioactivity. In order to handle this large volume of samples more rapidly arrangements have been made for the U. S. Geological Survey, certain U. S. Bureau of Mines stations, and local and state agencies, to test most of these samples for the Commission.

A further indication of public interest in the Domestic Uranium Program is the increasing number and variety of portable Geiger counter models now on the market for prospecting use.

Quartz Hill near Central City, Colo. Source of only domestic pitchblende production in early part of century

In June 1949 the handbook "Prospecting for Uranium," prepared jointly by the Atomic Energy Commission and the Geological Survey, was published; sales of this guide through November 1949 were over 40,000. Now in preparation and scheduled for early publication is an assayer's guide, designed to assist Government and private laboratories in making chemical assays for uranium.

The Commission will continue its raw materials program and attempt to improve upon it by every available means. The gratifying response from the mining industry, from public and private institutions and from the general public forshadows even greater interest in the future, and is a long step towards assured success.

Preparing to sump with a Continuous Miner

Mechanical Coal Mining

Curtailed Operations Impeded Achievement

By J. W. WOOMER
Consulting Mining Engineer
Wheeling, W. Va.

WHEN the final 1949 American bituminous coal production figures are compiled it appears that the industry will have produced approximately 430,000,000 tons with an estimated value of $5.13 per ton. This compares with the 599,518,000 tons in 1948 which had an average value of $4.99. It appears at this time that the nation's 1949 consumption plus exports will be about 475,000,000 tons.

The year was noteworthy in that although the slow machinery deliveries, slow construction work and car shortages experienced during 1948 were generally corrected, they were replaced with more serious problems, such as unusually heavy loss of working time due to strikes, memorial periods and short work weeks. In general, during 1948, getting maximum production per year was the number one problem. However, the problem switched during 1949 to one of getting maximum tonnage per working day with increased demands for a low cost and quality product.

Looking backward to tons per man, 1947 showed 15.93 for strip mines, 5.49 for deep mines and 6.42 for all mines. The figures dropped in 1948 to 15.28, 5.31 and 6.26 respectively, mostly due to the work-day shortening in 1947. Without benefit of the 1949 figures at this time, there seems to be no reason to believe that 1949 tons per man will better 1948 and most probably the final results will be lower.

In spite of coal customers and invested capital getting increasingly jittery over coal's future, the manufacturers, engineers, technicians and management in general have moved forward during the year toward the common goal of lower costs and better product. It is reasonable to predict that the final figures will show a decided trend from track to off-track equipment with all of the major manufacturers of equipment now able to provide such equipment. This trend towards what might be called a "rubber" transportation trend includes further advances in the application of belts, shuttle cars, rubber-tired jeeps, rockdusters, compressors and general service and material cars. Much of this new application, however, is strictly a face zone application. Improved coal, man trip and material cars on track continue to be applied to the movement of materials from the surface to the production areas particularly where distances are great.

Face Operations Make Steady Advance

As advocated for many years by engineers who know face problems, there was an accelerated installation of complete cleaning plants and driers, or additions thereto, all over the country. These were designed and made not only to improve the product but to permit more "high-speed" mining at the face irrespective of seam impurities. The final figures of these additions, when added to those projected at the year's end, will no doubt be an imposing percentage increase. This inevitable approach to coal cleaning is one of the outstanding steps accelerated during 1949. It means that face engineering can now be approached objectively without many of the former problems.

Increased application of the following tools and methods has been noteworthy:

(1) Compressed air to coal breaking
(2) Special tool steels to cutting and other coal jobs
(3) More water and rockdust to face areas
(4) Better "portal-to-portal" installations
(5) Improved electrical sectionalizing equipment
(6) Better self-propelled timbering and drilling machines
(7) Education for machinery maintenance

However, the two research problems getting the most attention during 1949 were roof bolting and the so-called continuous mining application.

Much has been written during the year giving company by company history of suspending roof supports from the overlying strata by using bolts and plates. There have been many disappointments but more encouragements and successes. It may be said that 1949 developed the technique of roof support by bolting to a great extent. In general, however, its great-

est contribution was in the field of permanent or semi-permanent supports rather than in face support while machinery is in operation. Since the outstanding conclusion in this matter was that each condition or each mine is a problem in itself, it does not seem that any broad conclusions regarding economics or even safety should be drawn at this time on what has been done.

Continuous Mining Develops

In the field of the "way-of-life" called continuous mining, it would appear that two outstanding conclusions have been reached by the industry during 1949. These are as follows:

(1) The so-called continuous mining machines now available are normal evolution and not revolution

(2) Present mining systems and available "back-up" devices will not give these or future machines the best opportunity to do their work. This work is to remove coal from the solid without excessive interference from complementary jobs

Extensive work was done and much experience gained in continuous mining problems, such as:

(1) Ventilation
(2) Drainage
(3) Power supply and cable handling
(4) Dust control by liquids
(5) Rock dust application
(6) Machinery speeds
(7) Face timbering
(8) Application of better steel to construction and cutting tools
(9) Face lighting
(10) Methods and devices for taking coal away from the machines. These may be grouped under the word communications
(11) Education of personnel
(12) Size consist and quailty of the product

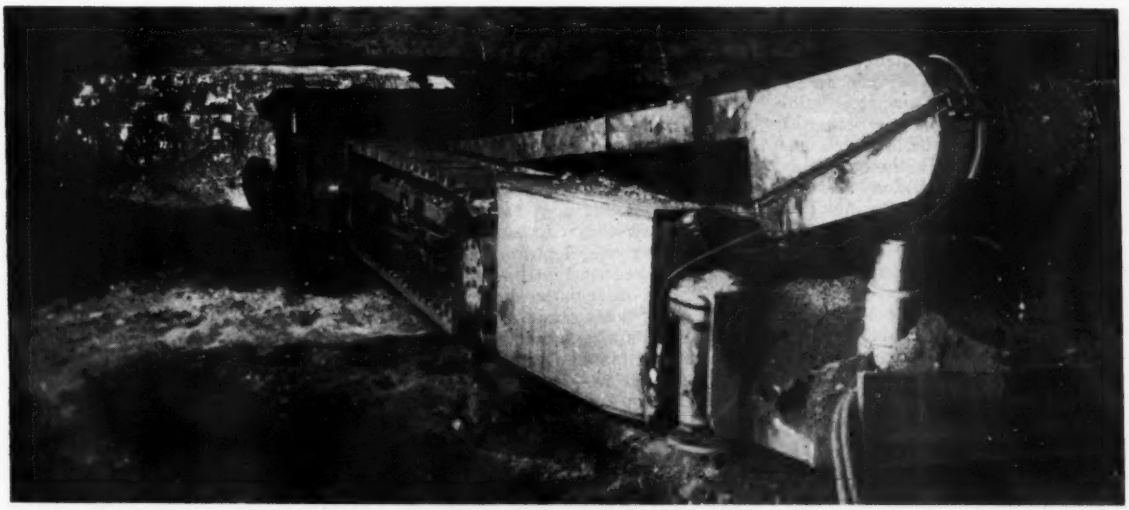
Roof bolting may prove answer, in many mines, to problem of roof support

After all of the progress is reviewed, however, these problems seem to be subject to greater improvements. But even with a maximum solution of each item, the fact remains that with present mining systems it appears that continuous mining machines will always be idle some time due to interference given such a high-speed operation by these auxiliary jobs. The ultimate objective appears to be a system where the machine can work continuously and still give space and time to provide ventilation, drainage, water, rockdust, roof support, power and maintenance to the working place.

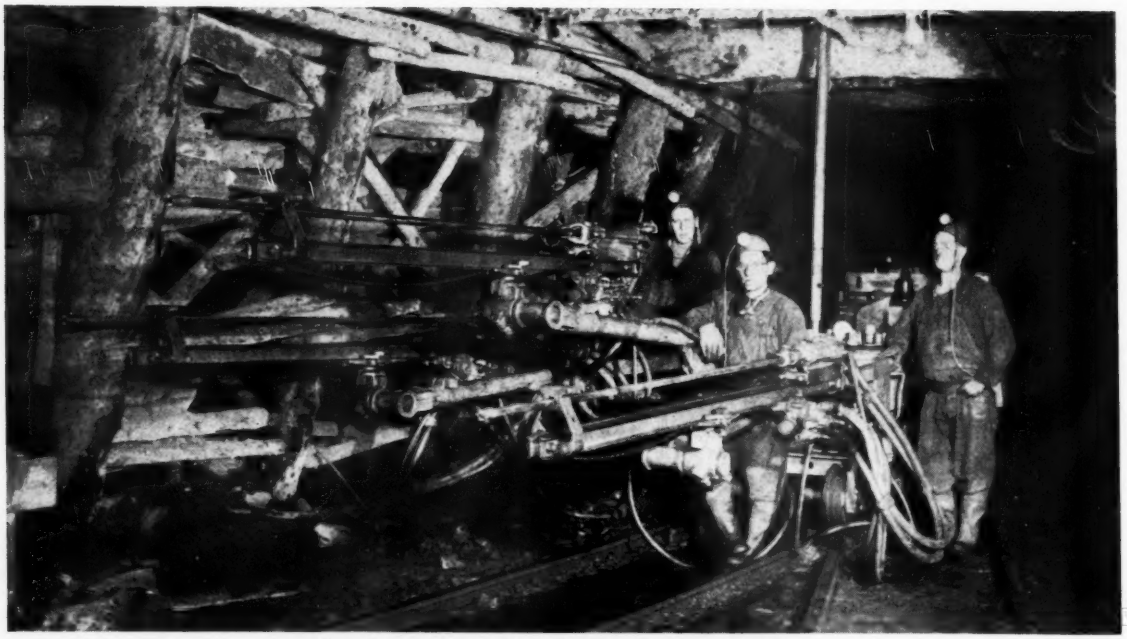
Longface Methods Offer Promise

In this connection, engineers are now reviewing longface mining techniques in the light of such new tools. Certainly an objective look at this method and its modifications in the light of present needs is sound. We do know that such longface work gives continuous ventilation, drainage, room for timbering, wetting, rockdusting, transportation and power supply within the working place, solely due to the size of this working place. Because of this, the work being done in Canada with a type of continuous miner on longfaces will be watched carefully by American operators. It is also well known that at least two additional continuous mining machines will be unveiled in the near future. Perhaps they will make a contribution to the over-all problem.

One of the most impressive facts of the 1949 bituminous industry has been the record attendance at technical sessions and exhibitions of the various organizations and professional engineering societies. This indicates the need and the desire for up-to-the-minute information and stimulation in the common job of reducing costs to meet the industries' need. If the present pseudo-political-labor problems can be overcome, it is reasonable to believe that the industry can make progress in 1950.



Low-type Colmol for continuous coal production



Long-feed jumbos and insert bits speed heading driving

Metal Mining Practice

Drilling, Blasting, Loading and Transportation Advances Dominate Year of Progress

By JOHN CAMERON FOX
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Columbia University

THIS has been an outstanding half century. The two most destructive wars of history, the advent of the radio, automobile, airplane and the submarine all took place in this period of slightly more than a biblical generation. The average man thought that his species had conquered all the worlds there were, but during this last decade another world, the atomic world, has posed a new frontier. We are also well into the world of supersonic speeds. What new frontiers will open up before us, it is impossible to say. One thing is certain, the mineral industry will continue to supply the basic raw materials for the constructive and the destructive efforts of the race. The millenium has not yet come. Let us hope that until it does arrive that peace and prosperity will reign and that men will have enough common sense to settle their differences over the council table and not on the field of battle.

During the past half century we have been using up natural resources at an ever-increasing rate. In general man has been fortunate enough to be able to locate new mineral deposits to replace those which he is constantly depleting. New sources of mineral wealth will have to come from lower grade deposits which can only be worked efficiently if new ways of winning ore can be devised. The working of low grade mineral deposits entails the handling of large quantities of material with speed and safety and at as low a unit cost as possible. The mining industry has kept pace with the ever-increasing demands of civilization for raw materials by doing an excellent job of research and experimentation and adoption of new methods and equipment to facilitate production of the raw materials of the thews of civilization. Much credit is due to those whose creed it is that "What was good enough yesterday is not good enough for today; and today's best will not do tomorrow."

A conscientious man can, through physical effort do about one horsepower hour of work in an eight-hour shift. If electrical power costs 2c per kilowatt hour, a machine can do the same amount of work for 1½c. Mechanization then is the answer to getting the most amount of work done at the least cost and with the least physical effort on the part of the worker.

Rock Breaking Advances

Fragmentation procedures have advanced a long way from the days when thousands of slaves under the lash of an overseer clawed at the ores of the Rio Tinto deposits in Spain with their fingernails, and little else. Now certain ores are made to break themselves through the judicious application of barodynamic forces, aided and abetted by rock drills.

The majority of ores are too strong to be mined by caving methods as we know them and must, therefore, be drilled and blasted. Man has evolved many ingenious methods of getting high explosives distributed throughout the mass of geologic material he wishes to break into pieces suitable for handling. One of the latest aids to this end is the development of the tungsten-carbide tipped drill bit. Interest in the use of this aid to fragmentation has continued at a high

pitch. Most emphasis has been placed on the use of the tungsten-carbide insert as used with the percussion drill. However, there may be a use for tungsten carbide as a substitute for diamonds in the rotary drill bits in certain formations. Its application to the drill steel used with percussion drilling machines takes two forms. The first is the use of the insert to form the cutting edge of a bit forged on the end of an alloy steel rod. In the second, the insert is employed as the cutting edge of a detachable bit.

Experience with both has shown that, when properly used, the tungsten-carbide insert bit will far outlast any other type of bit made. The loss in gauge is slight and the most prevalent reason for retiring a bit from use is the loss or breakage of inserts, usually due to poor alignment of the drill in the hole, or, in the case of the bit being an integral part of the rod, breakage of the rod itself. With detachable bits, too, there has been trouble reported from rod failure, either in the threaded portion or from fatigue. Alloy steel drill rods have eliminated some of the latter trouble. The consensus of reports is that the hard-tipped bit has its best utilization in drilling hard formations. It should be combined with a lighter, faster rotating drill. This use favors the first type of employment, mentioned above, where a smaller drill rod can be used.

Reports from those who have experimented with the tungsten-carbide insert all tell of great savings on the cost per foot drilled over the ordinary steel detachable bit. The Tungstar Corp., Bishop, Calif., has been using a four point carbide-tipped bit forged on the upset end of an alloy steel rod. A set of three pieces is required which cost $48. Previously, the company used detachable steel bits which cost 40c each. These average 24 in. of hole; 150 bits were used for a round, one set lasting for three rounds. The total cost for the three rounds of the life of the detachable bit was $60 or $20 per round, plus sharpening costs. The carbide-tipped steel drilled from three to five rounds before resharpening became necessary. Using the more conservative figure the cost per round was $16. This was a saving of $4 per round for the hard-tipped steel exclusive of the savings in labor, time, air and explosives.

Lake Shore Mines Ltd., Ontario, Canada, found that drill rods with two-point bits cost an average of $20 each and lasted 248 ft. The cost per foot drilled for them was 8.06c.

Climax reported costs of 3.1c per foot for Carset bits and 3.3c per foot for carbon-steel rods, 6.4c total per foot drilled.

In evaluating the relative advantages of the tungsten-carbide tipped bit, economies in the cost per foot drilled are not the only criteria to be considered. The uniform size of the smaller drill hole which results from the use of these bits permits the use of smaller sticks of denser dynamite distributed uniformly along the entire length of the hole. There is thus a saving in the amount of dynamite needed to fill the hole and a better utilization of that dynamite. In addition to the savings in dynamite costs, better fragmentation results with a reduced amount of secondary blasting. There is a saving in labor attendance on the drill and in the shop, as well as in the amount of air consumed. First cost and maintenance of the lighter drill is lower. Drill runners have a lighter physical task.

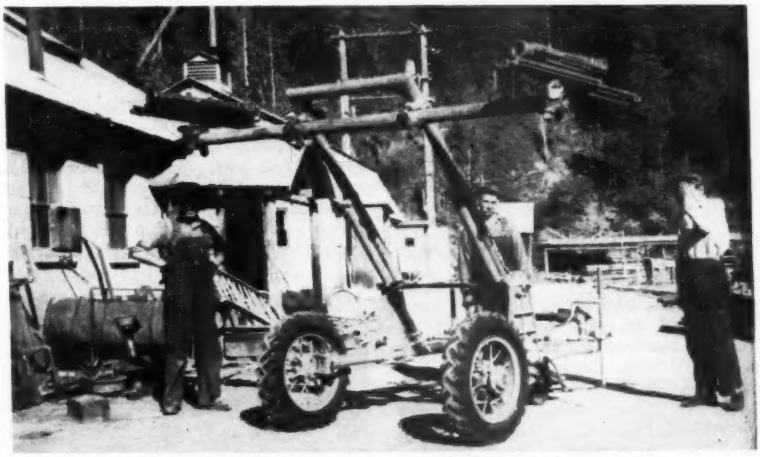
Long Hole Drilling Costs Cut

The great increase in the use of diamond drills for blasthole drilling has provided a mass of information and a number of interesting mining methods. Analysis leads to the conclusion that the cost per foot drilled depends largely on the cost of diamonds and the cost of labor. Both costs show every sign of increasing. Recognizing this fact, the application to long blasthole drilling of percussion drills and tungsten-carbide bits was studied by the Howe Sound Co. at its Chelan Division. As a result, diamond drilling has been supplanted at this property by percussion drilling of long blastholes with tungsten-carbide insert bits with a saving of 25 percent in cost per foot drilled. This substitution has taken place not only in regular mining operations, but in such applications as raising, driving openings for stope filling, cableways, pipe lines, etc.

In a symposium on tungsten-carbide bits and single-use bits at the American Mining Congress Convention in Spokane it was brought out that the latter are gaining in favor as experience is accumulated. The manufacturers have been active in working to overcome some of the objections brought to their attention. New designs are represented as being easier to remove from the rod and to resist loosening while in the hole. Greater simplicity is claimed in preparing a rod to be used with the single-pass bit and the full cross section of the rod is utilized. The use of single-pass bits has made it possible, in some cases, to cut in half the labor required to keep the drillers supplied with steel.

Jumbos Boost Productivity

In the interest of reducing the manual labor required of miners, there has been a growing trend toward the use of jumbo-mounted drills. With several machines mounted on the same carriage, it is possible to operate more drills with fewer men and at the same time produce more footage. The longer changes possible when hard-tipped drills are used has led to the development of longer drill carriages. A number of properties are now employing jumbo-mounted drifters with 4-ft feeds and aluminum shells. The Bureau of Mines, at Rifle, Colo., is using a tractor-mounted jumbo mounting four, 4-in. diam percussion drills with 15-ft feeds.



Rubber-tired jumbo used at Reeves MacDonald zinc mine

The Tri-State Mines Division of the Eagle-Picher Mining and Smelting Co., which was the first to use jumbos, have developed a tractor-mounted jumbo with a 65-ft telescoping mast to reach the roof of some of the large open stopes that characterize mining operations in that field.

In the realm of blasting, there have been some new developments during the year 1949. One of these is the addition of seven more periods to the

series of nine fast-delay caps. The last delay in the series is timed to go off 550 milliseconds after the zero delay. Each of the new delays starting with No. 10 is separated from its predecessor by 50 milliseconds. No. 9 detonates 25 milliseconds after No. 8 and so on back to No. 2. Delay No. 1 detonates eight milliseconds after the zero delay and 17 seconds later, No. 2 detonates.

An interesting experiment in the use of millisecond delays was reported from the Mount Weather Station of the U. S. Bureau of Mines. A series of raise rounds were drilled and blasted with a smaller number of holes (28 compared to 32 in the standard V-cut round used before) by eliminating the V-cut and using millisecond delays. Results reported so far indicate that the method is practical and economical. At a number of other locations millisecond delays have been used in all types of mining operations with the result that primary blasting is so much more effective with these caps that secondary blasting is reduced from 30-50 percent. In addition to this saving there is less noticeable concussion and vibration. Experimetnal work seems to indicate that the interval between delays must be carefully determined to derive full benefit. In some cases 50 milliseconds has been found too slow.

Drilling and blasting seem to have been fertile fields for improvement of mining methods through the use of research and experimentation. "The promise of a real advance in mine mechanization by drilling improvements is close to realization."

Heavy Equipment Goes Underground

Operators and manufacturers have cooperated on the improvement of loading machinery. In the Tri-State Mines of the Eagle-Picher Mining and Smelting Co. the development of trackless mining and use of caterpillar-mounted loading units has gone hand in hand. These loading units are Diesel-powered. One type used is a large-sized rocker shovel that loads into a truck without turning. The other types work as "shovel dozers" and must make a 90-deg turn to load. Some of the mines are still using slusher drags for loading. "The composite picture of loading at all mines using Diesel loaders and slusher drags, both cat-mounted and stationary, over a hopper for a six months' period was 38c per rock ton."

Manufacturers of coal loading machinery have continued to move over into the hard rock field. Abrasion-resistant steels have been substituted for the parts which showed most wear from ore materials.

Where large openings are possible, the underground miner has continued to steal a page from the quarryman's book. There are several electric shovels of conventional design in use in underground service. The Bureau's experimental mine at Rifle, Colo., is using a 3-cu yd shovel. A somewhat smaller one is in use at Allen Adit Mine at Galena, Ill.

On the Mesabi, as in other places, the challenge of mechanization of loading is being met through the use of trackless loaders and shuttle cars. Other operators are using ingenious

Skip and cage operation is improved by rubber-tired rollers

combinations of loading devices such as rocker-shovel and scraper in tandem for cleaning up stope bottoms below the level of the drift.

Haulage methods have improved with the adoption of large capacity loading units. Diesel haulage underground has been under continuous development. Where the size of opening permits, large capacity trucks are being used. However, much work remains to be done before the internal combustion engine is universally accepted for underground work. The day is not so far off, though, when long electric power lines and compressed air lines may no longer be necessary.

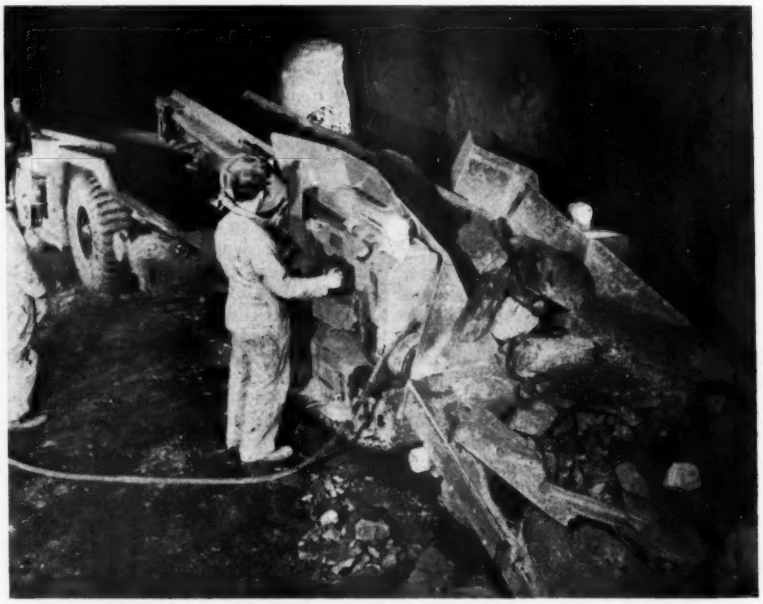
Conveyorization Increases

Shaker conveyors and belt conveyors came in for their share of attention with an increase in installations. The shaker has found its place principally as a feeder to the belt conveyor, which is used for the long haul to the shaft bottom and, in more cases than heretofore, on up inclined shafts to the mill.

The use of the conveyor has brought more primary crushing plants underground to keep the belt supplied with more uniformly sized material.

There have been improvements, too, in mine cars and locomotives to keep pace with the advances in other departments. Cars are of larger capacity, made of lighter materials, and more easily emptied. The Diesel locomotive is making its presence felt and the electric locomotive is faster and more powerful.

Given improvements in breaking, loading and hauling capacity, hoisting becomes the bottleneck. There have been notable advances in this field. Skips and cages now have rubber-tired rollers to run along guides in vertical shafts. Inclined shafts are provided with conveyor belts. Hoisting plants have dual motors and greater capacity than ever before. Skips are larger and are made of lighter alloys. Hoisting systems are provided with electronic controls and safety devices. Two-way communica-



Cat-mounted loaders plus shuttle cars make a productive metal-mining team

tion via FM radio is here to stay. New methods of speeding up the hoisting cycle and making it more safe are tried out and adopted as soon as their worth has been demonstrated.

In spite of the high degree of mechanization that the mining industry has reached, the biggest single item on the cost sheet is still labor. The cost per man hour of labor seems destined to continue its rise. To justify increases, each man must be persuaded to produce more. Mechanization alone cannot materially increase the output per man day if the man does not have the incentive to produce more and the peace of mind necessary to devote himself to the performance of his duties. To this end, much work and thought has gone into the evolution of incentive plans and safety programs. Training programs are increasingly adopted by companies large and small. The health and safety of the miner are receiving more and more attention.

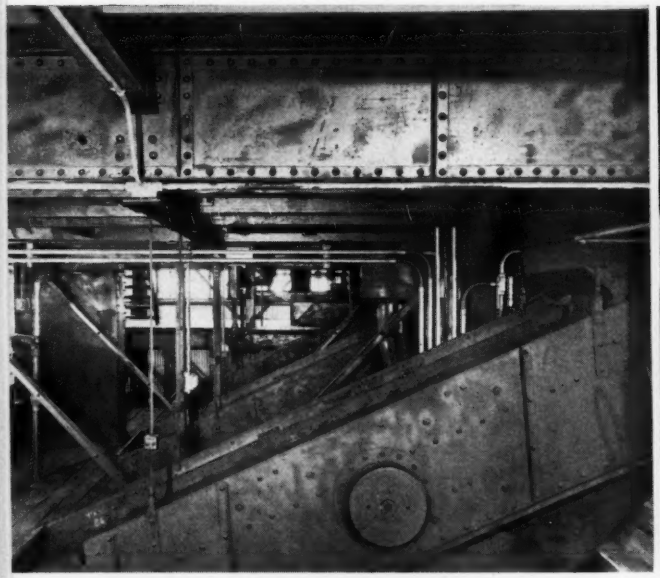
Much research and test work is going into the problems of roof support. Greater attention is being given to roof bolting as a means of support. The Bureau of Mines has a crew in the field visiting mines all over the country to observe conditions and initiate programs where this type of support may be feasible. Private industry has already adopted the method at many mines with gratifying results.

As mines go deeper and the cost of timber goes up, more mines are using steel sets of various designs. The use of steel permits equal "in-the-clear" space in drifts with smaller "outside-of-timber" openings. Roof bolting may give even better results in this direction. More work will be done in the future with the support problem.

Track-mounted loader speeds drifting in Lead Belt operations

It has been the purpose of this review to recount some of the ways in which forward-looking members of the mining industry have advanced the arts of fragmentation, loading and transportation during the year just ended. If a large portion of the review has been devoted to the advances achieved in drilling and blasting, it is because that branch of the art has shown the most startling changes. Perhaps in the next year or so the emphasis will be on loading or transportation. The stage seems to be set for some rapid advances in trackless mining and the expanded use of internal-combustion engines underground. Wherever the emphasis may fall, continued success and progress will be the result of the enterprising attitude of every member of the mining profession.

Mule haulage in domestic metal mines has been supplanted by electric and Diesel-powered equipment



Accurate sizing is basic to good preparation

Hand picking is still effective for certain types of coal

Coal Preparation

Production Uncertainties Reduce Demand for New Plants

By E. C. CARRIS
Assistant to the President
Roberts and Schaefer Company

THE demand curve for complete preparation plants and equipment for the passing year has bent downward. The cleaning, or washing, equipment contracted for during 1949 was of the order of 12,000 tons per hour of raw coal while that of 1948 was in the neighborhood of 20,000 tons.

This noticeable falling trend in the curve does not mean that there has been a decreased interest on the part of the coal producers for the purchase of complete plants, and the modernization of obsolete ones. Nor does it mean that the coal consuming market has returned to that of a seller's nature. Quite the contrary, there has never been a time in the history of the industry when the producer has had his product more closely scrutinized by the consumer than during the past year. The consumers are asserting themselves in no uncertain terms in their demand for consistant and better prepared coals. The specifications of the consuming market are progressively becoming more stringent and exacting. To meet demands for lower ash, sulphur and moisture, for greater cleanliness, better size consist, higher Btu content and ease of handling, many producers must get back into the groove they got out of some few years ago and direct attention to better and more consistent preparation.

Where the demand curve for preparation equipment will level off is beyond anyone's conception. It is the humble opinion of the author that it will level off and ascend just as soon as the operating companies are relieved of the uncertainty that has harassed them repeatedly during the past year due to spasmodic operation and a monopolistic controlled work-week. Is it any wonder that many operators have neglected preparation problems in spite of a complete buyer's market and the keen competition within the industry, as well as the continuous and increasing encroachment of other fuels?

Decreased demand for preparation equipment and complete plants has afforded the manufacturers and the contracting engineering firms a breathing spell that has allowed them to catch up with the backlog accumulated over the higher demand period; however, in spite of the lull, some are still constructing plants that were contracted for two years ago. Nevertheless, it is now possible in most cases for them to accept a contract for a complete plant with all necessary auxiliary equipment, to design, construct and place it into operation in a much shorter period than at any time during the past several years.

Approximately some 12,000 tons of hourly capacity in cleaning equipment was contracted for during the year as compared to 20,000 tons per hour for the previous year. The major portion of this equipment was purchased for complete preparation plants, but the remaining portion was purchased for existing plants either without cleaning units, or to replace obsolete ones.

Some Innovations Installed

Many of the complete plants are still in the construction stage. Some will be placed into operation the early part of this year, while others will not be in actual operation until some time later. A few of these plants incorporate new features pertaining to mechanical, and thermal, drying of fine, wet, washed coal, as well as clarification of the washer water system. Other innovations of extreme importance will be two large capacity pneumatic plants, one of which will clean the entire mine production, screening and crushing the plus 1¼-in. material and

mixing it back with the pre-dried natural minus 1¼-in., making a final feed product of 1¼-in. by 0 in. to the cleaning units. The full range is cleaned en-masse in three definite size sequences, or ranges on three batteries of new oscillating machines. The other plant includes pre-drying of the minus ⅜-in. material and treated en-masse in two definite size sequences.

One dense-media plant using sand as the cleaning medium will feature a cone, making a middlings product. Although two or three cones have been making such a product in England, it has never been actually tried in a commercial plant in this country.

Several installations of the Dutch cyclone in multiple are being installed in existing plants to assist in improving the clarification of the recirculating water; thereby decreasing the amount of fine solids flowing into the sewer or settling pond.

Dense-media cleaning machines utilizing magnitite ore continue to create interest. During the past year, one or two complete plants were contracted for, and several package or pre-fabricated units were purchased and installed in existing plants to clean small tonnages and specific size ranges. One large plant using this this type of cleaning unit, contracted for the latter part of 1947 and placed into operation the early part of 1949, has incorporated a new development which classifies the minus ¼ in. at high capacities previous to tabling. Although this plant has been in operation for some months, no performance data has been made available to the industry.

Another plant, and perhaps the largest of all time, was placed into operation recently. It contains some new features, the most important of which is the method of dewatering the fine coal and the removal of fine solids from the circulating water. This scheme incorporates the use of vibrating screens, vertical, and horizontal type centrifuges, plus thickeners and vacuum filters.

Two large jig plants, cleaning a range of 8 by 0 in. and 6 by 0 in. will be placed into operation early this year. Both these plants incorporate new schemes, more or less similar, of dewatering the fine coal and clarifying the washer water. The design of both plants utilizes large rectangular settling tanks, horizontal high and low speed centrifuges plus thermal driers; their performance is awaited with keen interest by the coal industry.

A fine wet-coal plant, contracted for last year, will feature the utlization of a hydrotator-type frothing unit in the clarification system to recover and process the extremely fine coal behind a vertical centrifuge and hydraulic classifier. The performance of this innovation is most important to those operators with limited settling-pond space and the increasing stress placed on stream pollution laws. This unit provides mining companies with an instrument for recovering fine slurries and sludges and processing same for mixing back with coarser coals, or thermal drying and blending back with pulverized coal.

The above figures are approximate and may vary plus or minus when final and authoritative information is revealed; however, the above is accurate enough to show the choice of mining companies for the year just passing into history.

Types of Cleaning Machines Purchased

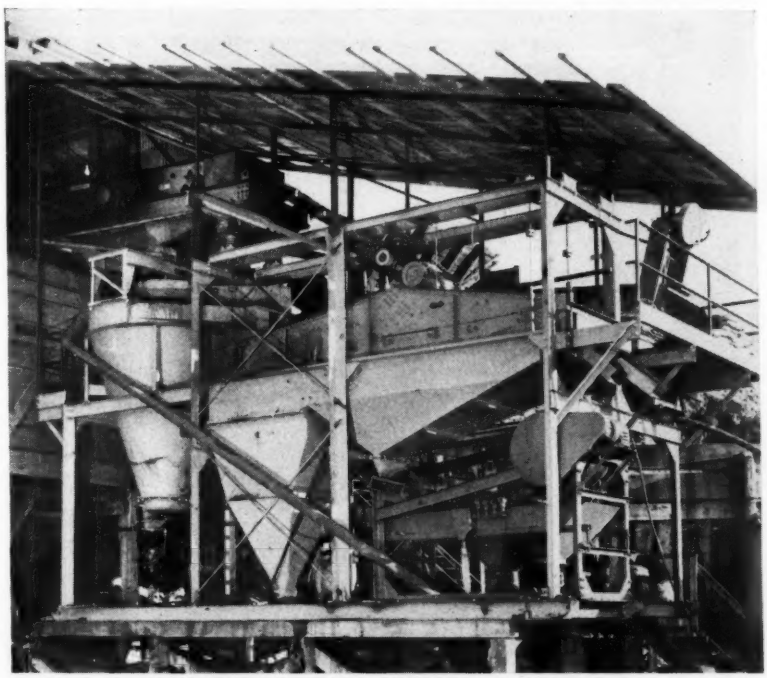
Type-Unit	% of T.P.H. Sold
Baum Jigs	50
Sand Cones	12
Super-Airflows	9
Concentrating Tables	8
Hydroseparators	7
Hydrotators	3
Prins Launder	3
Menzie Cones	2
Dense-Media Drums	2
Dense-Media Mills	2
Free Discharge Launders	1
American Air Table	1

Hand Picking and Refuse Disposal

With the rapidly growing trend to all-seam mining, with full mechanization and the depletion of cleaner seams, the removal of large impurities in the preparation plant continues a real problem. Some of the existing plants are meeting this problem by installing specially designed oscillating picking tables. This table is designed in such a manner that the pickers can sort the impurities from the coal by merely pushing it to one section of the table with the osscillating motion of the table conveying or transporting it to the disposal bin or to a crusher that prepares it for the refuse disposal system. In some new plants, the revolving breaker has been selected to scalp off the large impurities before delivering to disposal system; while other plants either scalp off both the lump coal and large impurities by means of the oscillating screen and deliver it into a crusher or discharge the entire mine production into a crusher and reduce it to 6 or 8 in. previous to mechanical cleaning.

Those producers wishing to continue making a lump coal will find the sectionalized sorting table highly efficient. It has cut the picking cost of lump in half. In spite of the development of this table, there are many producers who continue to pick coarse coals at extremely high costs and waste with obsolete picking arrangements.

Combined reject disposal is continually growing more difficult and extremely expensive. This is particularly true where available space is limited, and reject must be trucked up steep grades on the side of mountains. In locations of this sort, many companies continue to use single, or continuous bucket aerial trams, although some more recent plants have been equipped with rubber belt conveyors delivering it to bin and larry on top of the mountain. This method of disposal has not been in service



A Mobil-Mill handles output of R.P.M. Inc. in southern Illinois

long enough to predict its economical suitability. This type of disposal is not without its disadvantages in low temperature weather. The concentrators and return idlers must be maintained free of ice accumulation.

Disposal of plant reject is one phase of preparation that must receive careful consideration as it may represent the largest item on the cost sheet. Likewise, consideration must be given to the prevention of reject piles burning and giving off obnoxious gases. This is being studied by a specially appointed committee that will soon divulge some interesting findings.

Sizing and Screening

With depletion of thicker seams and the mechanization of thinner ones, the problem of screening has become more and more difficult. The increasing stress on dust allaying has not aided this situation, but rather has aggravated it to the extreme insofar as removing the slack or pulverizer sizes are concerned. Many producers in existing plants have found it necessary to increase the screening area by either replacing present screens with ones of larger area or replacing them with screens of greater efficiency.

In new plant design, it is well to devote considerable attention to this phase of preparation as inadequate presizing ahead of cleaning equipment can, and has, meant the difference between inefficient and efficient satisfactory and economical performance in many plants. It is desirable where uncertainty exists, to provide available space in the design for additional screening. This can be a wise and profitable investment.

One, or perhaps two, of the vibratory screen manufacturers have revived or developed a screen containing a sectionalized rubber ball tray just below the screen cloth deck, making the fine coal separation, the object being to have the balls bounce up against the cloth so as to decrease the buildup of fine damp particles on the wires of the cloth, maintaining maximum open area at all times during operation. Several of these screens have been installed and are in operation; however, no actual authentic comparative figures have been presented to show the efficiency of this unit over the present types of vibratory screens.

Another type of vibratory screen has been designed especially for fine coals below ⅛ in. This unit consists of a single deck, that is divided into three separate surface sections, each section adjusted to a different angle of repose, progressively decreasing from the feed end to the discharge end. Each section is dressed with a progressively finer opening cloth. What information that is available is of a rather meager nature; however, it is sufficient to indicate better efficiency can be expected.

Coal Blending

The captive mining companies continune to make use of large blending systems previous to cleaning, as well as after cleaning in some instances. They justify this costly investment in the production of greater uniformity in the finished products, resulting in savings in per ton of steel produced.

Not many of the commercial producers can justify this investment, although several of the more recent plants incorporate a reasonable size bin, or bins more or less for storage purposes, in order to insure maximum operating time of the mines.

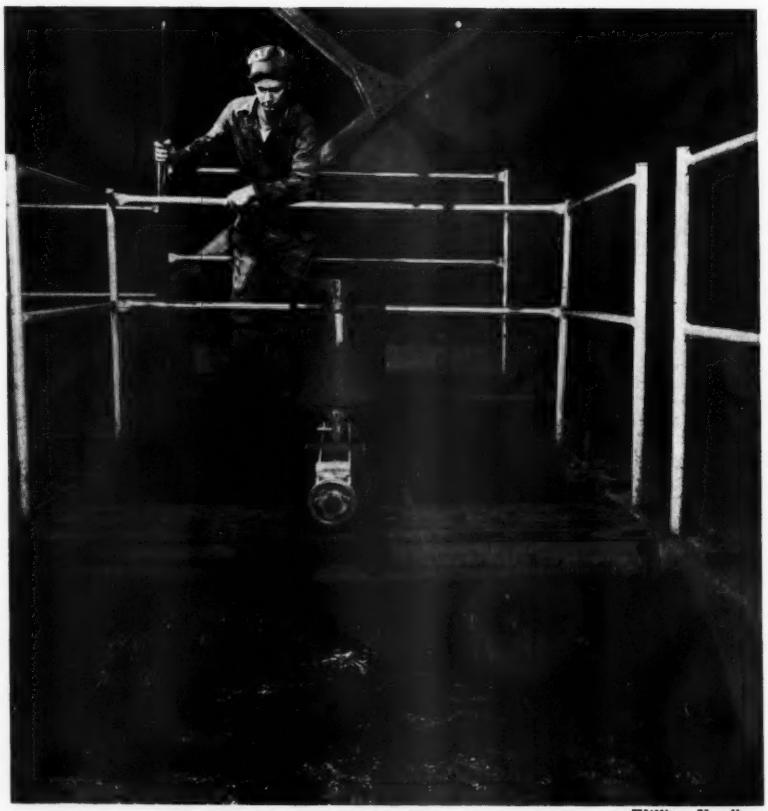
It is not always necessary to invest in large, expensive blending bins ahead of a preparation plant. However, it is vital and of extreme importance to provide storage sufficient to produce a constant and uniform feed to the plant. The author has never felt that large and expensive bins were necessary merely to provide protection against mine operating time through breakdowns within the plant. Any well planned and coordinated plant operating and maintenance procedure will be ample insurance.

Mixing and blending of prepared coals, particularly those sizes that form the consist of nut slacks or screenings, continue to create interest among some commercial producers. The demand for consistent and uniform size consist is becoming more and more important to the consumer. No producer of mixtures or blends can well afford to overlook this phase of his preparation program. In many cases, uniform size consist will outweight quality.

Mechanical Drying

For the coarser sizes down to and including the stoker sizes, flexible and vibratory type screens are the predominate choice of operators. Most existing plants, as well as those recently designed, employ a combination of the two types for maximum removal of surface moisture without thermal drying.

Most of the fine, wet-washed coals are being dried in vertical and horizontal type centrifuges. The latter type has become increasingly popular during the past year, and many units have been installed in both new and old plants. Its popularity, no doubt, is due to the high recovery possible, and the recirculating of its effluent through the cleaning system over a long period of time without wasting fine solids to the sewer. The dried product or the cake from it has not been entirely acceptable in most cases because of the higher surface moisture, except where the cake is mixed back into the coarser coals and shipped as mine run. Even then, repercussions



—William Vandivert

Coal flows through wash boxes at high speed in modern preparation plants

from the consumer are evident because of excessive moisture content.

Excessive clay content in colloidal suspension will create considerable operating troubles, and detrimental effect to the performance of this machine. In cases like this, it is a necessity to deslime the feed and add a predetermined amount of fresh water in order to obtain a satisfactory performance.

The manufacturer of this machine has made a definite contribution to wet preparation of fine coal; and although it has not been the desired ultimate, it has nevertheless increased the possibilities of closing the clarification system with less equipment. With the increasing stress on stream pollution by many of the coal producing states, this unit will play a predominate part in the future.

The vertical centrifuge, although it does not equal the horizontal type in recovery, does produce a much lower moisture cake, and is the choice machine by many mining companies throughout the bituminous region. It is hoped that manufacturers of this unit will make every effort possible to improve the recovery without sacrificing the unit's ability to produce a low moisture cake. The excessive amount of fine solids creates an uneconomical loss in most cases and a disturbing stream pollution problem. Just the reverse of the horizontal type, the recovery must be increased without increasing the moisture of the cake. Perhaps the manufacturers are working on this and will come up with something in the near future.

Thermal Drying

Mining companies are taking more interest in the art of thermal drying since the consumer is exerting himself no end against paying freight on water and unloading frozen coal during low temperature weather. High moisture is becoming more objectionable than excess ash to various consumers. Many of them will accept higher ash content in preference to high moisture. To cope with this situation, the screen type unit is being used to dry stoker coals. However, one newcomer is now on the market. Two installations have been made in the Indiana Region, which from all indications are operating satisfactorily.

The cascading multi-louver type has been developed primarily for the drying of the finer sizes; however, it can be used satisfactorily without excessive degradation on sizes up to a top of 1¼ in. Two of these units have been in operation over a period of two or more years pre-drying ahead of a battery of pneumatic cleaning machines and have met all expectations in an efficient and economical manner.

Two large units were installed during the early part of the year for drying the minus ⅛-in. wet-washed coal. Although no performance data pertaining to these two units has been made public, the operating company feels that they are quite satisfactory and has just, within the past month, placed another one into operation at one of its other plants.

Vertical stack driers, although not new to the coal industry, have however come forward in no uncertain terms during the past year. Several installations were made for drying wet cleaned minus ¼ in. sizes. Insofar as available information indicates, this type machine has never been purchased for drying coal ahead of pneumatic cleaning units. However, there is nothing to prevent its application to pre-drying. In fact, it is possible that in some plant designs it may be more desirable. This dryer, like the multi-louver, has found acceptance among many commercial producers and definitely has a place in coal preparation; however, they have not been accepted by the captive mine owners. They are more or less unanimous in the theory that thermal drying oxidizes the coal; thereby changing its coking characteristics. This is possibly true for an extremely small percentage of coals, and even on these, oxidation is slight. The captive operators seem willing to accept the higher moisture products and its handling disadvantages at times of low temperature, than to add the initial investment and operating costs of thermal drying.

Crushing

In an ever-increasing number of plants, crushers are being installed to reduce the large coal and refuse to a size range which can be handled in the cleaning system, or scalping off the large impurities and reducing same for ease of handling in disposal equipment, the coal in turn being reduced and united with the smaller sizes previous to cleaning.

Many crushers of all types are being installed in existing plants in order to reduce the coarse prepared coals to stoker sizes or modified resultants. Many of these installations are staged systems in order to reduce the amount of slack or pulverizer to a minimum. Practically all of the new plants include some type of crushing system to provide flexibility for seasonal market demand. No producer of commercial and domestic coals can afford to be without this flexibility in his preparation plant.

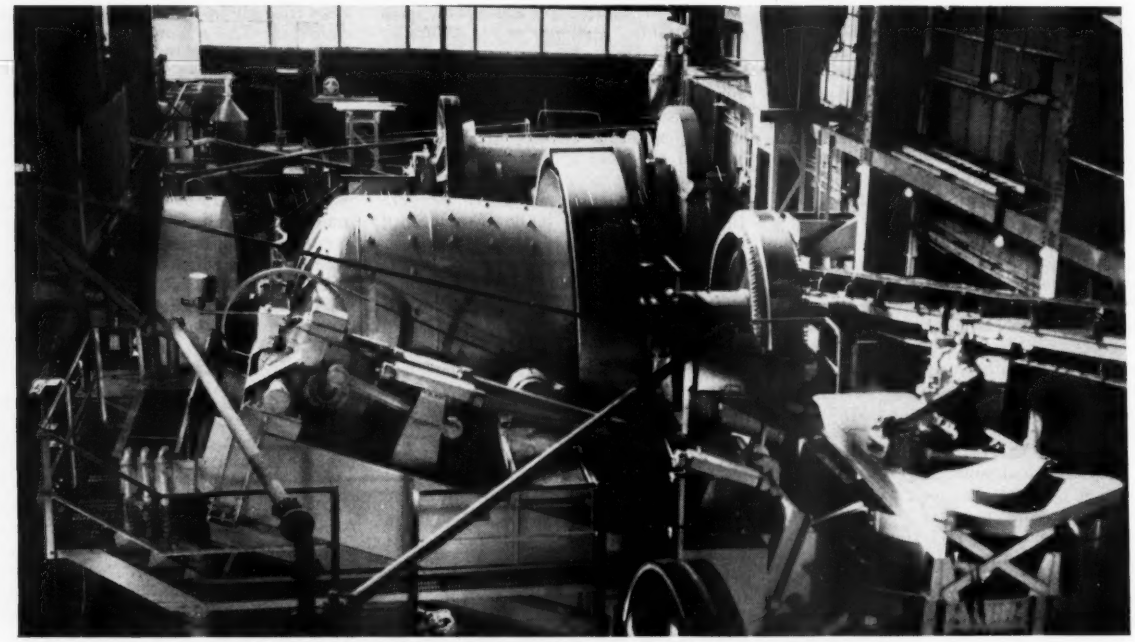
Froth Flotation

Considerable interest has been revived in the possibilities of employing oil flotation for cleaning coal slurries. The fine coal hydrotator has been redesigned and developed for this purpose. The results have been most gratifying. One commercial installation will be in operation in the very near future. This unit will be operating in series with a vertical centrifuge and an upward current fine coal classifier. The scheme is to recirculate the centrifuge effluent to the classifier and discharge the overflow from the latter to the frothing unit for processing and removing the fine coal particles from the circulating water.

One type of frothing unit has been more or less redesigned for greater recovery and an installation has been made in Alabama treating sludge underflow from dewatering screens. Information thus far discloses the operating results to be attractive; however, it is insufficient to appraise it from an economical standpoint.

Summary

In summing up the various innovations and developments in coal preparation for the year of 1949, it appears that many of them are in the adjusting stage, while some have unquestionably proved acceptable from an operating viewpoint; but from an economical standpoint, it is still just a little early. Then, again, there are those which were installed and placed into operation during the year of 1948. Yet, as strange as it may seem, we have no authoritative and concrete information available even at this late date. It is hoped that the producers who have and are incorporating new ideas in old and new plants will, after a reasonable operating period, present to the coal industry their impartial findings, not only as to operational performance, but as to the economics as well. In this unselfish manner, and only by this manner, can the industry determine the true and honest commercial and economical value of any coal preparation innovation or development. There has never been a time in the history of the coal industry when the divulging and trading of information pertaining to the economical improvement of the quality of coal and its use was of more value than at present.



Rod mill, slow speed ball mill, and hydroscillator of Tennessee Copper Co.

A Perspective of Milling Operations

Past Progress Notable—Further Improvement Indicated

By NATHANIEL HERZ
Chief Metallurgist
Homestake Mining Company

PERSPECTIVE is defined in the Standard Dictionary as " a distant view," or "the relative importance of facts or matters from any special point of view; also their presentation with just regard to their proportional importance." This dictionary also gives the following quotation from Hazlitt's "Table Talk": "seen in the distance, in the long perspective of waning years, the meanest incidents . . . become interesting." Thus, milling operations may be viewed from a given point in space or in time. The same dictionary defines milling as "the act or process of operating a mill or mills"—and a mill is "an establishment for reducing ores by a process other than smelting." This gives plenty of latitude to present a distant view of facts or matters pertaining to the operation of an establishment for reducing ores by a process other than smelting, with no geographic limits, and from prehistoric time through the present to the infinite future.

Milling plants usually make use of one or more distinct unit processes to achieve their results. In a general way, these unit processes fall into two groups, that may be described as comminution and separation. By the first the size of the ore or rock particles are reduced from run of mine to as fine as required for the second; by the second two or more products are made, one or more of which should satisfy either of these two criteria: (1) it must be richer than the original ore in a valuable constituent; or (2) if not richer than the original ore, it must be of such a nature that a valuable material such as a metal may be readily produced from it.

Impact Machines for Ore Crushing

Processes of comminution may be divided into two classes, crushing and grinding; here the division is based largely on size of product and only partly on method used. Crushing originally was accomplished by impact alone, pounding one rock upon another. Then came the sledge, and later the stamp mill, still depending upon impact. In modern crushers for hard rock, such as gyratory and jaw crushers, impact is minimized, and some type of lever mechanism applies pressure. This is generally accepted as the most economical procedure for crushing hard rock, although for softer or less abrasive materials impact machines have been quite successful, as in the cement industry. Recently some impact machines using harder abrasion-resistant wearing parts have spread into the ore crushing field; this may expand the usefulness of impact crushers and might stimulate the makers of pressure type machines to improvements in design. Such competition is desirable; that is the way progress is made.

There is a border-line zone between crushing and grinding with grinding moving up into rather coarser sizes and taking over more territory. Fine reduction crushers of the cone or

gyratory type are coming into more general use, especially displacing rolls, but rod mills, particularly in larger plants, are crowding upwards into the same field. Chilean and Huntington mills are out of the picture entirely; they, like rolls, crush by pressure. Gyratories are of the pressure type; cones may do some work by impact. As the slope of a cone lessens in the fine crushing type, the speed with which rock particles fall may be reduced by friction against the cone. With a sufficiently large throw of the eccentric, there could be quite a sharp blow on the rock particles.

Rod Mills Give Uniform Product

Rod mills are coming into greater use as fine crushing mills. In this service they usually operate in open circuit, taking feed from ½-1 in. or over, depending upon the size of the mill, and make a product with maximum particles around 6-14 mesh. Large mills are often used, many being 8 or 9 ft in diameter and 12-15 ft long. One is more nearly equal in its dimensions, being 11½ by 12 ft. Such a mill might grind something like 350 tons hourly. In a way, the action of a rod mill resembles that of rolls; all rock particles must pass repeatedly between the rotating rods, while the rods are always kept from actual contact by the ore in the mill. As a result, no really large pieces can escape grinding; also, no excessive quantity of slime is produced. No machine in the same range of work produces as uniform a product unassisted by accessory equipment and closed circuiting. It is this property that makes a rod mill operated in open circuit the most efficient fine crusher now available.

Ball mills originally were long cylinders, resembling tube (pebble) mills in their design. With closed circuiting and ample classifier capacity for returning unfinished material while overflowing that which is sufficiently ground, mill diameters have increased, with lengths about equal to the diameter or only slightly greater. Mills up to 10 by 14 ft in size have been built. Ball mills produce more slime than do rod mills, but also pass more oversize. Thus, they work more effectively in conjunction with relatively large classifiers and a fairly heavy circulating load.

A quarter of a century ago rod and ball mills were usually considered as about equivalent, with the major difference being in the grinding media. Since then there has been a gradual change, with rod mills moving upward and ball mills migrating downward in the particle sizes of feed and product. In many plants there have also been changes of speed; rod mills are often operated at a higher per cent of critical speed than are ball mills, especially when the ball mills are used for regrinding. This provides more grinding capacity for a given rod mill, but at a price; liner wear is increased, and rod wear probably also. There is cascading with impact as well as rolling with pressure and attrition. It enables coarser feed to be taken, but if too coarse, there is excessive wear of shell liners at the feed end of the mill as well as tapering of the rods, causing waste of steel. When ball mill speeds are lowered, it eliminates most of the impact; smaller balls may be used on the finer material provided by the rod mill, and grinding is done by pressure and attrition. With pressure rather than impact favored for dry crushing of hard rock, and the same true in fine grinding in ball mills, is it not reasonable to expect moderate speeds and pressure grinding to be more economical in rod mills? For coarse feeds, larger mill diameters might be needed to supply pressure required to break the larger fragments. In the larger ball mills depending upon pressure rather than impact, we find smaller balls with their greater relative surface being adopted in more and more plants. Does the same follow in rod milling, and would a slow speed, large diameter mill loaded with smaller diameter rods than usual do more work per kilowatt hour?

Rods and Liners Could Be Improved

As to materials used in grinding mills, rods are usually 3 in. in diameter, of high carbon (about 0.9 to 0.95 percent) steel. Balls may be chill-cast iron in small sizes, ni-hard, forged carbon steel, or alloy steel, depending upon local conditions. Might not some specially treated alloy rod be worth investigating if such material is worth while for balls? Liners vary greatly, from cast iron through ni-hard to carbon and alloy steels, with as many variants in design, being smooth, pocket-type, ship-lap, wave or plate and lifter; in the last the plates and bars are often of different materials. So many factors are involved in the choice of liners that no general rule can be formulated. A comparative study of liner service as well as ball and rod wear would be valuable to the industry, with results from different mills properly tabulated and correlated. Such results should include wear of steel per kilowatt hour as well as consumption per ton ground. For any given ore it is a fact that the steel wear per kilowatt hour is a constant over a wide range of grinding conditions, while the consumption per ton of ore increases with the fineness of grind. This comparative study would result in the determination of a factor for each individual ore that might be called the abrasiveness factor, a measure of steel wear per kilowatt hour expended. This factor in combination with the well known one for grindability would make possible sound engineering comparison of grinding operations and also lead to more accurate estimating and planning of new milling operations.

Screening and Classification

Along with crushing and grinding, separatory processes are often required as accessory to proper comminution. In crushing plants we frequently find screens; progress has been from trommels to modern high capacity vibrating screens, either mechanically or electrically powered. Slot screens are being increasingly used in the finer sizes, with less blinding. With proper vibration frequency and amplitude rather damp and somewhat sticky material may be handled with fair success.

In wet grinding operations, classification is generally required, and almost every ore provides its individual problems. If we have a homogeneous material with only one mineral constituent, classification is synonymous with sizing, but in most milling processes the problem is more involved. We have heterogeneous mixtures of minerals varying in specific gravity, in friability, and in particle shape, so in any hydraulic classification we have the effect of all three properties; an overflow product may contain coarse low density minerals, fine grains of higher density, and others of various sizes; the more friable minerals are found in increasing quantity in the finer sizes and the tougher ones in the coarse portion.

A proper study of any individual classifier performance in a milling circuit requires more than screen analyses; it requires investigation of sized fractions of the products, often involving assays or even rather complete chemical or mineral analyses of some of them to determine optimum conditions. Since a classifier can have zones of free settling and of hindered settling, and may also have something resembling heavy media separation in the same machine, much can be done to vary the size distribution of the valuable minerals. Rapid elimination of free mineral and gangue with retention of middling in the grinding circuit is the ideal condition that can never be attained but should be approximated as closely as possible. Controllable variables include dilution or pulp density, amount of agitation, and velocity of flow; these are somewhat interlocked, with changes in one often affecting the others.

These separations by screening and classifying are considered as purely physical processes, depending on particle size alone or size and density (or sometimes shape), and this is largely true of most separatory processes. However, with physical chemistry and chemical physics overlapping, we at times find ourselves uncertain as to how to class a process. Addition of

certain chemicals may cause dispersion of some minerals; other reagents agglomerate certain minerals. Thus we obtain effects that yield results equivalent to changes in particle size, making the minerals so affected behave abnormally, and we obtain a different result from classifiers or other machines making separations by physical processes.

Gravity Concentration

In the various operations constituting gravity concentration, we can trace progress from simple sluices and riffles to automatic strakes and Humphrey spirals; from pans or vanning shovels to modern tables, and from wicker baskets through hand jigs to modern jigs. In all except jigging agglomeration is occasionally of value, extending the use of the process to minerals otherwise not amenable to such treatment. Another gravity separation that is rapidly gaining in importance is the Heavy Media process; in effect this imitates the heavy liquids used in the laboratory to separate light and dense minerals, using a suspension of fine ferrosilicon or galena in water to simulate a heavy liquid. In some variants of this process fine ore slimes may be used; some iron ores are being treated in this manner. Another physical process used in special cases is magnetic separation, which is becoming increasingly valuable for certain iron ores and some other ferruginous minerals. Originally limited to dry materials, wet magnetic separators are now well developed and highly effective. Electrostatic separators are also available for specialized use; a separation by electric conductivity is also possible. An interesting device is the Dutch States cone that multiplies the force of gravity by centrifugal action; this has interesting possibilities as it is a very compact unit of high capacity.

Extensive Flotation Research

Flotation is in a class by itself. Here we have another process that combines chemical and physical effects; it has been called concentration upside down, as usually the heavy minerals are floated and the lighter ones sink. Probably more research work has been done on flotation problems than on any other branch of milling in the past 30 years, with far-reaching effects on both milling and smelting, and the end is not in sight. In general, combination of reagents are rather well known so efficient separations of the common sulphides may be readily made, but occasionally a troublesome condition is found. Often traces of certain constituents show marked effects; impurities in mill water or slight changes in ore may require rather important alterations in reagent control. Since relatively small variations in temperature, pH, and in conditioning reagents sometimes produce such great changes in results, is it not possible that the presence or absence of traces of certain elements or minerals in an ore might have similar effects and not have been given due consideration? There is some supporting evidence for such an idea, sometimes involving catalytic action, sometimes inhibition.

Flotation of nonmetallics is making great strides; feldspar, fluorspar and phosphates may be mentioned. Some cement plants control their mix by floating certain undesirable minerals out of their ground mix.

Equipment Improvement

Continuing progress is being made in design of milling equipment, much of it now being precision built rather than crudely constructed as was common half a century ago. Antifriction bearings, automatic lubrication and many other modern mechanical features are the rule now rather than the exception. Many valuable accessories are available. Magnets are commonly used to remove tramp iron, and there is an electronic device that gives a warning of any metal on a moving belt, whether magnetic or nonmagnetic. Rubber is being used more and more to resist abrasion, as are new abrasion-resisting alloys. Plastics are used in filter fabrics.

Economy Dictates Simple Flowsheets

The general trend in flowsheets is toward simplification, usually resulting in the use of fewer but larger units, and often in a reduction in the number of points where recoveries are made. It is a great change from the old all-gravity concentration mills with many stages of sizing and classification to a modern all-flotation plant with one point of recovery. We still have our greatest losses in the slime fraction; is it possible that sometimes simplification has gone too far? Although a minimum number of recovery

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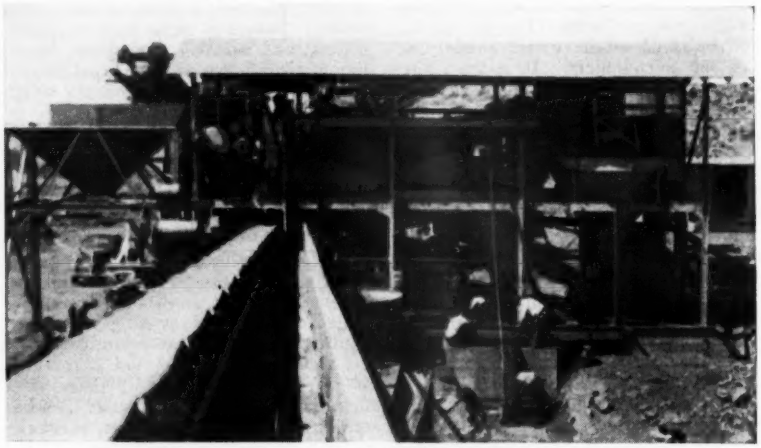
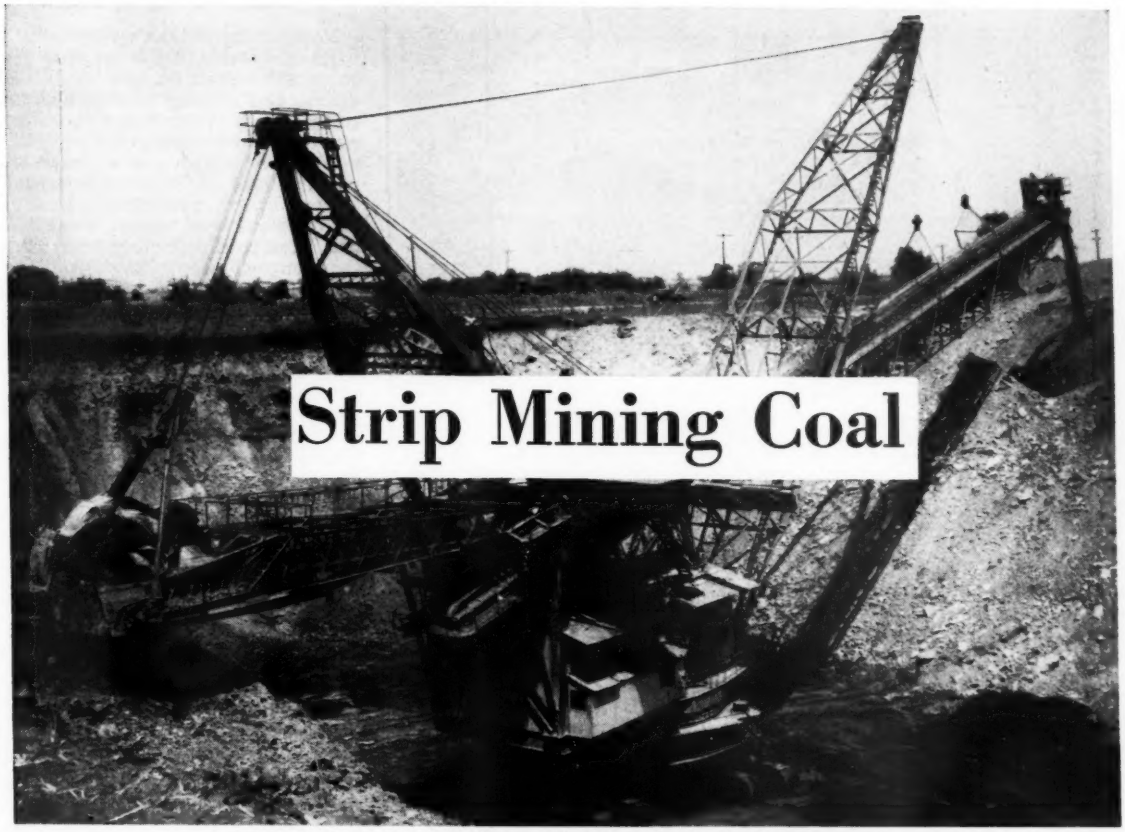


On a Minnesota iron range, a Mobil-Mill handles 175 tons per hour

Humphreys spirals at Climax recover from molybdenum flotation tailings, a concentrate containing tungsten, tin, topaz and monazite



Strip Mining Coal

The wheel excavator provides a method of continuous overburden removal

Steady Increase in Tonnage Marks Industry—New Equipment Improves Operating Efficiency

By R. H. SWALLOW
Chief Engineer
Ayrshire Collieries Corporation

WITH the completion of the year 1949, the strip coal mining industry passed through another important phase of its growth. Although production was retarded because of labor strife and curtailed working time, based on estimated figures available for 1949, open-pit mining accounted for 23.5 percent of the coal production in the United States. This shows an increase of 0.3 percent over 1948 when the percentage of strip mined coal was 23.2.

It is interesting to compare the average tons per man per day produced by strip mining and by underground methods. As indicated in the accompanying charts, strip mining ranges from a low of 14.68, in 1939, to a high of 15.93 average tons per man per day in 1947, as compared with a deep mine range from 4.60, in 1938, to 5.49 average tons per man per day in 1947.

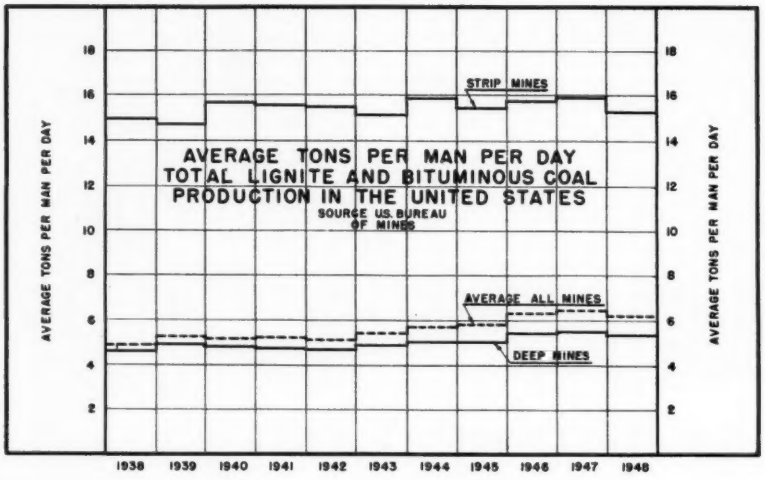
In analyzing the chart showing strip coal production by states, it is seen that, although Pennsylvania leads in total production by a large margin, the number of tons produced per mine is considerably less than production from mines in the midwest. Generally, it is noted that the average tons per man per day produced is greater in those states where the larger mines are located. The state of Montana shows a phenominal production per man per day of 84.12 tons. This unusual output is explained by the fact that there are only two strip mines in this state, both of which are operating in coal seams of great thickness underlying shallow overburden which often gives ratios as low as 1 to 1.

High productivity and resulting lowered costs of operation account for the increase in the growth of strip mining over the years. Although the last few years have seen an increase in the installation of large capacity stripping shovels and draglines, increasing depths of overburden have tended to keep the productivity per man per day to a fairly constant rate. Similarly, the production output per stripping unit has remained over the years at approximately 41,000 tons annually with a slightly higher average during the war years. Ratios of cubic yards of overburden to tons of coal uncovered have steadily risen and in some cases are as high as 20 to 1.

Overburden Removal

In open-pit mining the primary problem is the removal of the overburden. This is now being generally accomplished by shovels and draglines singly, or by these units in tandem, or by shovel with a dragline as a booster in the spoil banks. Because of deeper overburden, the last few years have seen the manufacture and installation of many more draglines due to their long reach and ability in spoiling overburden further.

On the average, both shovels and draglines spend only about 33 percent of their time in digging: 67 percent of the working time is spent in conveying, dumping and returning for the next cycle. As the average operating time of a large stripping excavator is


AVERAGE TONS PER MAN PER DAY
TOTAL LIGNITE AND BITUMINOUS COAL
PRODUCTION IN THE UNITED STATES
SOURCE US BUREAU OF MINES
STRIP MINES
AVERAGE ALL MINES
DEEP MINES
AVERAGE TONS PER MAN PER DAY
1938 1939 1940 1941 1942 1943 1944 1945 1946 1947 1948

only about 80 percent of the possible working time, it is obvious that these machines are only actually digging 25 percent of the time. Even with this amount of productive effort, the strippers have shown an enviable record over the years, but if they are to progress, improvements must be made towards a continuous stripper.

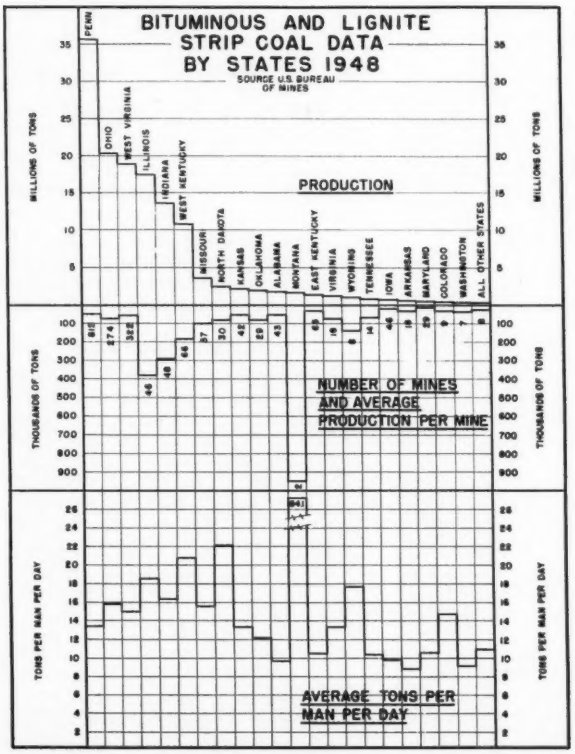
For several years now, two-wheel excavators have been operating in the midwest removing overburden in a more or less continuous manner although operating delays have occurred because of material sticking to the buckets and conveyor belts. Although these machines are new to this country and have been undergoing extensive tests and improvements, their recent production records indicate that they are a forward step in the strip mining industry. As a result, a third machine of this type is now on order with one of the manufacturers and is expected to be placed in operation during 1950. Up to the present time, these machines have been limited in the nature and type of overburden they will handle, but it is possible that the wheel excavator will be the approach to a continuous stripping unit.

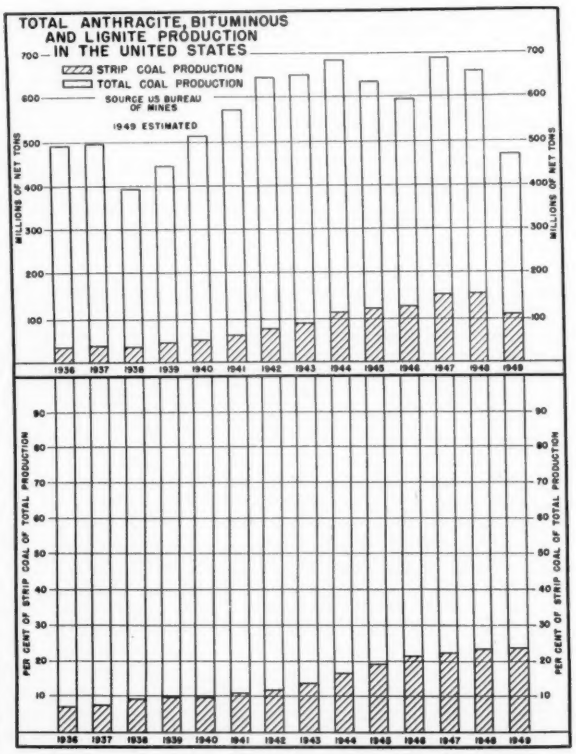
No stripping tool can work efficiently unless the overburden is properly prepared. Consequently, new methods of drilling and blasting the high wall are being tested. Larger and more efficient overburden drills are being developed and at present an improved rotating type of overburden drill is being built. This machine is to be an improvement over several machines that have been previously built using the rotary oil-well drilling method for vertical drilling. Similarly, new types of horizontal drills are continually being tested.

The manufacturers of fixed explosives are trying to improve the quality of their product. In large operations liquid oxygen is still a primary explosive in breaking hard rock in the overburden. The use of delayed action blasting detonators in shooting is reported to help efficiency.

During the past year, a new type of self-propelling vertical coal drill has appeared, and reports on footage drilled per man by this unit is considerably greater than the record of previous machines of this type.

Credit should be given to those manufacturers who are willing to spend capital in experimenting on new tools and machines. Similarly, praise should be given to those operators who devote the time of their personnel to testing and trying to cure defects in new types of equipment.




TOTAL ANTHRACITE, BITUMINOUS AND LIGNITE PRODUCTION IN THE UNITED STATES
STRIP COAL PRODUCTION
TOTAL COAL PRODUCTION
SOURCE US BUREAU OF MINES
1949 ESTIMATED
MILLIONS OF NET TONS
PER CENT OF STRIP COAL OF TOTAL PRODUCTION
1936 1937 1938 1939 1940 1941 1942 1943 1944 1945 1946 1947 1948 1949

Haulage Improvements

Another phase of open-pit mining which has received careful attention during the past year is the transporting of coal from the pits to the preparation plants. Manufacturers are continually redesigning haulage trucks for more efficiency and capacity. Last year several new large type 38-ton payload single-tired trailer tractor units were installed for the first time in an opencut mine. Previously, units of this type were used by contractors in earth moving work and proved so successful in soft ground that it was felt these units would be advantageous in strip pits, particularly in dragline operations where it is necessary to run the haulage units over slick mucky fireclay. Although 20-ton units of this type have been successfully used for many years, it was only through the research and efforts of the rubber companies that tires of the size and durability required have made possible the development and use of units of this size. The ability of large single tires to maneuver through soft roads has proven superior to the smaller dual tires.

The use of torque convertors in haulage trucks in place of transmissions has been tried out in the open-pit mines in the Mesabi Iron Range and no doubt will soon make their appearance in open-pit coal mines. The elimination of time lost in shifting gears and the savings in maintenance should lead to an improvement in haulage costs.

Mention of haulage equipment always implies the necessity of maintaining good roads. Over the years, efficient operators have been careful to provide good side ditches, drainage, ballast and proper attention to the surface condition of the haulageways. Tractors, road maintainers and sprinkling units are as important as the trucks themselves.

A 38-ton, single-tired, tractor-trailer, coal-hauling unit

Coal Preparation

With the return of business to normal and a buyers' instead of a sellers' market, the importance of proper coal preparation is definitely established. The past year has seen the erection and completion of many new coal preparation plants as well as additions to existing plants. The predominance of new plants has been of the completely wet type, featuring the Baum type jig. Many of the washers built during the past year were of a combination jig-launder or jig-concentrating-table type.

In certain sections of the country, special efforts have been made in the use of heavy media processes. Experiments are continuing in the use of cyclones for fine coal separation. Froth flotation is also receiving careful attention. Some new plants have improved their refuse disposal problem by hydraulically pumping a part or all of their refuse, instead of hauling it by truck. Strip mines especially can use this method of disposal because of the availability of equipment for building reservoirs and ponds or the nearness of old abandoned pits.

It seems that the problems in drying coal are never completely solved, so experiments toward improvements are continually being made. One eastern manufacturer has been testing a new type of screen, forced-air heat drier that may show merit. A new design of hot-air, cascade type drier has been developed in the midwest and installed in several new plants where engineers are watching results with interest. Centrifuges are receiving attention and the development of the solid bowl type to replace the screen type may provide interesting results. Many flash type driers have been installed for improving the moisture percentage in fine coal.

The use of oil treating for stoker coals continues to be an important factor in sales. Most installations are of the heated oil method in which the grade of oil used solidifies at sufficiently high temperatures to eliminate greasy, dirty conditions at the point of consumption.

With increasing costs of production and the declining realization, care must be taken at all preparation plants to recover all coal possible. Fine coal cleaning and the replacing of dewatering screens before they wear too much are important phases in recovery economy. Proper adjustments of wash boxes preclude excessive losses to refuse. These later objectives are only obtained through proper laboratory control. Although a well-equipped chemical laboratory may seem expensive at first glance, the savings in recovered coal and proper preparation amply repay the costs. The sales angle of giving a customer a refined product is vitally important although hard to evaluate in dollars and cents. This is particularly true now that consumers are buying coal on the basis of cost of quality and heat unit values. Many new coal contracts provide debits or credits on the basis of analysis and number of heat units in the coal. It means that coal is being purchased on the basis of Btu of heat rather than by weight of the product. This requires careful laboratory control by both the operator and the consumer.

Hampshire hogs thrive on mineral-rich spoil banks

Safety has been emphasized in all phases of strip mining and particularly in connection with electrical layouts. Many mining companies are now installing ground protective electrical equipment on 440 v as well as 4160 v circuits.

Thorough prospecting and engineering are essential to successful stripping operations. Detailed operating maps made by either field survey

parties or by aerial photography are the basis for future operating plans. Some companies lay out cuts for several years in advance on their maps. By using the prospect drill hole data, surface and coal contour information, it is possible to predict fairly accurately the maximum possible production targets for months in the future. Techniques and prospect drilling rigs have been improved during the past several years with resulting lower footage costs. Geologic studies are important in the acquisition of additional strip coal reserves. Drainage, one of the big hazards of open-pit mining, is adequately provided for only if intelligent engineering is provided.

Strip Land Reclamation

No treatise on open-pit mining is complete without reference to the tremendous activities being exerted toward reforestation, revegetation and utilization of the spoil banks. The last few years have seen plans developed by the larger operators for spoil bank productivity.

One company is now beginning to realize profits from the raising and selling of hogs on spoil lands which were seeded with grasses and legumes by airplane several years ago. Two large auction sales were held during 1949 at one of the spoil bank farms and farmers from several states were present to bid on thoroughbred hogs raised on the supposed waste lands. As in the past, many herds of cattle are raised in the spoil banks with satisfactory results.

Reforestation is continuing with good results and many young forests are now developing. Some of the trees in the older plantings are now of sufficient size to permit sawmill operations to flourish. As the stands of natural timber disappear by logging operations, spoil-bank forests will no doubt provide the basis for pulp wood mills in the not too distant future.

Recreational facilities and fish and game preserves are further results of the utilization of open-pit waste lands. One outstanding example is a public park development in southern Illinois which was made possible through the generous efforts of a successful business man who developed old strippings into a beautifully landscaped tract of several hundred acres. Lagoons, terraces, foot bridges, roads, bridle paths, flowers and shrubbery have made this a popular recreation area for people in that section of the state.

The work of the conservation departments, the universities, the U. S. Experiment Stations and the coal-company foresters and personnel have helped to determine the type of revegetation and reforestation adaptable to various kinds of spoil banks, thus eliminating the loss of growth prevalent in the early years of waste-land planting.

Strip mining has now taken its place as one of the important phases of the coal industry. The strip operators have the same fundamental problems as the deep miners—the winning of coal under increasingly adverse natural conditions. However, with able management and careful future planning and development, open-pit coal mining should be a highly important phase of the extractive industry for many years to come.

A Perspective of Milling Operations

(*Continued from page 46*)

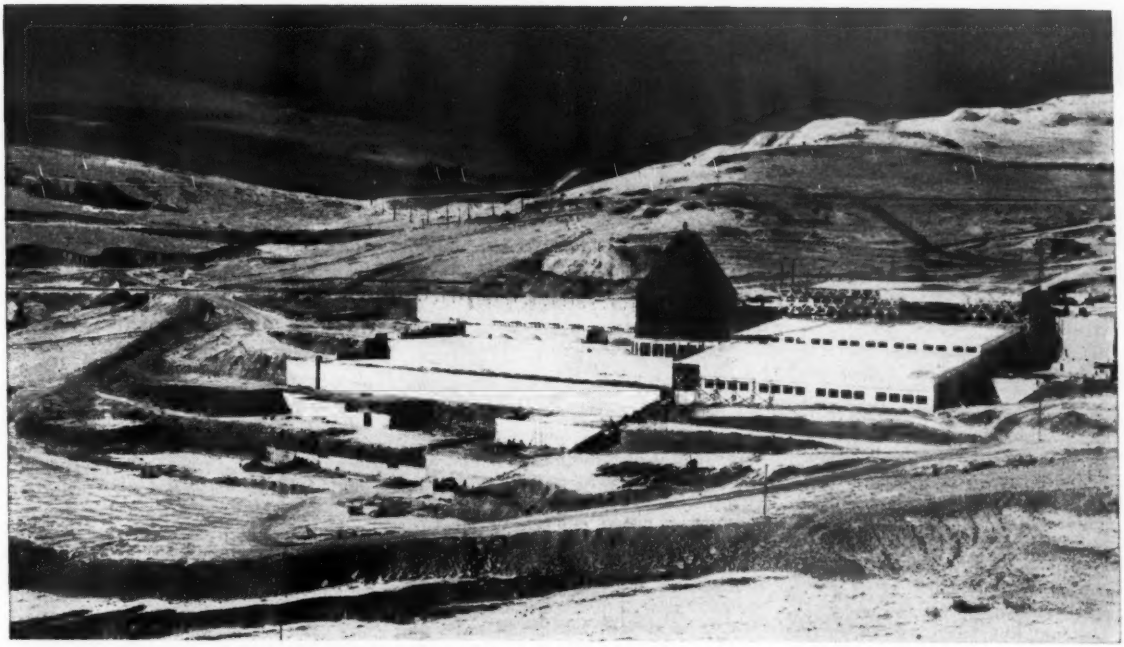
points makes a streamlined flowsheet that looks simple and efficient on paper, it is frequently economically sound to remove liberated mineral early in the process. It is still sound metallurgical practice to recover all you can as soon as you can; mineral jigs or unit cells are easy to operate and their use might improve results in some instances. Early removal of concentrate avoids overgrinding of mineral, and such overgrinding sometimes increases slime losses.

The movement toward simpler flowsheets and larger units is partly caused by higher costs of labor and supplies, by depletion of richer ore bodies, and by higher taxes, necessitating economies all along the line. To conserve labor, more automatic controls are being used. Mills have been compared to modern chemical plants, to the apparent detriment of our profession. These critics often lose sight of the fact that many chemical plants start with carefully selected raw materials of controlled composition; then the processing is conducted with complete uniformity by automatic control of everything entering into the reactions, including metering of flows of materials, control of temperature, pressure and other variables. If a millman could specify ore composition, hardness, grain size of all minerals, and control water composition, temperature and other variables, a completely automatic plant might be designed. We do find an increasing use of meters and control devices in mills; we have electric eyes and electric ears, automatic density and pH controls, and many other instruments, but the complete robot-operated mill is not yet in the picture, although the Noralyn phosphate plant comes close to it.

During the last half century ores of decreasing grade have been profitably treated. Some of these ore bodies are of relatively recent discovery, but many were known for a long time, although they could not be profitably worked until technology had progressed sufficiently to permit such operation. This improvement in technology has often caused the waste rock of yesterday to become the ore of today, and has increased our mineral resources enormously. Let us work toward continued improvements and thus try to make the waste rock of today become the ore of tomorrow. Higher costs of operation can offset some of our gains, as can unjust taxes. By one stroke of the pen in signing an unfair labor or tax bill, ore reserves may be wiped out faster than they can be developed, and the ore of today may become the waste rock of tomorrow. Let us hope that our legislative bodies and those who elect them can become properly educated so as not to nullify our technical progress.

Further Progress Assured

What direction will this progress take? We have no crystal ball, but are reasonably sure that lower grade ores must be worked. The iron miners are producing much tonnage by milling ores considered as waste only a few years ago. New materials are coming into use; titanium oxide replaces much lead in paint; titanium metal, if produced cheaply, could replace stainless steel in many uses. This may come to pass; it is not so long ago that aluminum was considered too expensive to be of general use and magnesium was almost a curiosity. Other progress may be made by applying milling processes to other materials than natural ores. For example, International Nickel is using flotation on a synthetic ore; a nickel-copper matte is cooled under controlled conditions. It is then milled by grinding, removing metallic particles magnetically, and the nickel and copper sulphides separated by preferential flotation. Who knows where this may lead? Can we process some of our more difficult ores and make new easily milled synthetic ore out of a low grade rough concentrate? In our perspective, the future appears small, but we can be assured that as it comes closer to us, it will expand until it exceeds the present just as the present always exceeds the past. Although currently with prices below the high point of last year and costs not appreciably lower the outlook seems a bit dull, the demand for metals will continue, and with tougher going, technical improvements will increase in the future to a greater extent than in the past. This has always been true, and there is no valid reason for assuming that the end of our progress has now been reached.



Carlton Mill of Golden Cycle Corp. will help to increase Colorado gold production

Honest Gold and Managed Currency

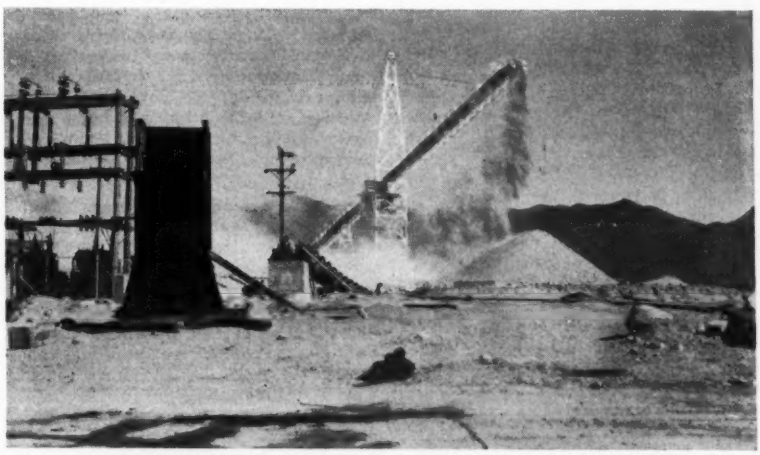
By MERRILL E. SHOUP
President
The Golden Cycle Corporation

How a Sound Monetary System Could Be Reestablished

ECONOMIC chaos is rampant the length and breadth of the world. Wholesale currency devaluations by more than 30 nations during 1949 and the attendant dislocations have further aggravated this condition, but the end is not in sight. Numerous economists, legislators, bankers, and business leaders agree that much of the worldwide debacle has developed because in the past 20-odd years so many powerful nations either have gone entirely off the gold standard or relegated gold to an inferior position and tried to replace honest gold with managed currency.

At no time, since 1933, has there been such widespread discussion of the "so-called" gold problem as today, and the drive to return to the currency of the United States complete gold backing gains momentum daily. There is good reason to believe that one of the most important problems facing the new Congress will be that of a complete return to the gold standard. Since this issue is so important to the present and future welfare, not only of the United States but the world, it is timely to record the facts about gold.

Gold is one of 93 basic chemical elements composing the world. It is one of the rarest elements, accounting for only one out of one billion parts of the earth's crust. Although found



Round Mountain Gold Dredging Corp. works deep gravels in Nevada

Snow Lake property of Howe Sound Co. came into production in 1949*

nearly everywhere, it is generally in such minute quantities that it cannot be profitably worked and occurs in commercial quantities in relatively few areas.

The world's gold production, during past years, has trended upward. It averaged 30,000,000 oz annually during the last five years vs. 22,000,000 oz during the period 1911 to 1915. There is in the world today, according to best estimates, only 56 billion in gold, accumulated since the dawn of civilization. The annual tax budget of the United States approximates 50 billion. Of this 56 billion, about 35 billion is in monetary form and 21 billion in jewelry and industry. The United States holds, calculated at $35 per ounce, about 25 billion of the total world monetary gold which weighs some 30,000 tons. All other nations combined have nine billions.

Timeless Measure of Value

Gold is the oldest accepted money known to mankind. It has been used as a medium of exchange for more than 5000 years. Because of its brilliant appearance, unalterability, and occurrence in natural forms, gold was the first metal to which man was attracted. It was known and highly valued by the earliest civilizations, the Egyptian, Minoan, Assyrian and Etruscan. It was used as early as the Fourth Egyptian Dynasty, 2900 BC, and through the centuries has continued preeminent among all other metals as the best medium of exchange. The fact it has been valued so highly for more than 5000 years is not accidental; it is because no other known metal or commodity possesses the inherent qualities of gold.

Gold is trusted by all the world to a degree not even approached by any other means, both as a basis of exchange and as a measure of the value of currencies. Gold is rightly regarded as a better security for wealth than the holding of promissory notes and currency issued by governments. Gold is a commodity in unfailing demand, with wide acceptability. It exists in quantities large enough to meet exchange needs, but is not so abundant as to lose its desirability; it is so durable it will not lose its exchange power through decay or deterioration; it can be divided into small units and used in transactions involving small or large amounts; it is homogeneous, and all parts or units have a uniform value and can be equally divided; it is portable and possesses cognizability; it has stability of value so that when contracts are made which involve future payment of money, both parties can have reasonable assurance that payments made in the future in gold will have the same absolute and relative position at the end of the contract as at the beginning. So, for more than 5000 years, gold has possessed, and still continues to possess more completely than any other known commodity, all these essential characteristics, and through all the centuries no other medium has been found which so completely fits all the monetary standards demanded by the world.

The reader of history knows that, since the dawn of civilization, the nation possessing, at any given period, the greatest gold stock has, during that period, lead the rest of the world in progress, achievement and advancement in government, industry and empire building. Chronologically, Portugal, Spain, Holland, France and, after the Napoleonic Wars, England, each in turn enjoyed great world leadership while each had a hoard of gold.

After the Napoleonic Wars, when the monetary systems of many nations were disorganized, Great Britain adopted a policy of pegging the price of gold, which innovation, "gold monometallism," was the greatest revolution for centuries in the use of money. This pegged gold price remained constant for nearly a century, until World War I. During this period England reigned supreme financially, commercially, and as an empire builder, and it was the most illustrious span of years in her entire history. Commerce flourished, trade became worldwide, and the Sterling Bill of Exchange, based upon a fixed value of gold, became the standard credit money of the world. Traders the world over, from China to Peru, became familiar with the Sterling Bill of Exchange, and from worldwide confidence in the English Sterling Bill of Exchange came the expression "as good as gold." The Sterling Bill of Exchange provided for the merchants of the world a reliable, stable, international currency.

Departure from Gold Precedes Decline

Great Britain finally found her gold reserves inadequate, and, after heroic efforts to prevent it, went off the gold standard September 21, 1931. In 1933, even the United States "went off gold," and in 1934, stopped all new gold coinage, withdrew all gold then in circulation, and put heavy penalties on private gold holding. From 1931 to date, due primarily to our great gold reserves, the United States attained first place as the world's greatest industrial and economic nation, and today we stand preeminent among all nations, the greatest and most powerful nation the world has ever seen.

Blockholing in a shrinkage stope at Homestake Mining Co.

We now witness, following World War II, the tragic plight that England and other formerly important nations are in commercially, financially, industrially, and in every other respect. Their troubles stem principally from a dollar shortage and the fact they are no longer on the gold standard. Floods of inconvertible paper and printing press money have been issued and politicians have tried to replace gold with inconvertible paper money and uncontrolled credit which has led to infla-

* Photo courtesy Dept. of Natural Resources and Industrial Development—Regina.

tion, misery, chaos, and, in some cases, to revolution.

Sound money is the keystone to worldwide peace and economic recovery. The American people are sorely disturbed by economic chaos at home and abroad, with the prospect of further regimentation, the further mismanagement of currencies and credit by politicians, and the possible resumption of controls. Karl Marx said, and Lenin demonstrated, "The surest way to overturn the social order is to debauch the currency"; and so persistently have we pursued this course the past two decades that today the dollar and all fixed dollar-value securities, including savings, pensions and life insurance, have lost since 1933 65 per cent of their purchasing power. High prices at home, economic chaos abroad, and threats of World War III can largely be blamed on the fact we have permitted politicians to debauch our currency.

A Return to Sound Principles

The United States has the power to give the world a sound monetary system, to return it to sound basic monetary principles, and to lead our nation and all the world out of chaos. How can the United States do the job? It could make a good start with the following measures:

(1) The Bretton Woods Plan was a major mistake, sold to the United States by Lord Keynes, whose brilliantly insolvent economics have from time to time been widely accepted in Washington. He originated the statement, "a national debt is of no consequence since we owe it to each other," and "gold is a relic of the dark ages." A major error in the Bretton Woods Plan was freezing world's paper currencies at inflated wartime levels, or at nominal values set by signatory nations. These values were fictitious then; and the fiction is glaringly apparent now, when inflation increases while world needs grow and production stalls. The failure of the Bretton Woods Plan to solve world difficulties has been completely demonstrated, as evidenced by the wholesale currency devaluations by signatory nations. The Bretton Woods Plan should promptly be abandoned or drastically revised to fit actual worldwide conditions.

(2) The United States should promptly establish a free market in gold. Identical bills were introduced in both Houses of Congress during 1949 to do this, giving the gold miner or owner the right to sell his gold at $35 per ounce; to take it to a better market, if he could find one; to keep the gold in its natural or refined form; to do anything else with it his mood or interest might suggest. This right was always enjoyed in this country from its founding until 1933. The charge has been made that these bills were introduced by gold mining interests and that we had a case of the "gold mine interests versus the people of the United States." This is not true. The free gold issue transcends the interest of the "so-called" gold mining bloc, the vested interests of planners, or of any other selfish group. The right to own gold—the correlative right to pass judgment on our own currency and credit conduct of our government—are all essential parts of that freedom for which we have fought wars and which by constitutional right belong to the American people.

(3) When a free market for gold has actually been established, and its true value determined by the natural laws of demand and supply, and not by money managing politicians, our currency should be made freely and completely convertible. The holder of paper money should have the right to convert to gold, and the holder of gold the right to convert to paper. Direct coinage and circulation of gold within the United States would entail no difficulties. The American citizen still has faith in his currency, but he also needs a restoration of faith that the government will never again deprive him of his choice between paper money and gold. The dollar today is in fact a world currency; indeed, the only one. The International Bank and Fund are dollar institutions. Once the dollar becomes hard currency in the full sense of the word, the international gold standard will be reestablished whether other countries like it or not.

(4) When a free market for gold has been restored; the dollar value of gold, determined by the natural laws of demand and supply, and full and complete redemption and convertibility restored, the currencies of the rest of the world should be tied to gold on their actual dollar gold value basis. This would help to bring freedom of trade and commerce between nations, would help to stay the issuance of unlimited quantities of printing press money and granting unlimited credits, and would help hold down the ever-increasing inflation spiral which, if not checked, will engulf us all. Nations would have a common exchange denominator, gold, to determine the exchange value of their goods and services. Orderly commerce and trade would help end worldwide misunderstanding, chaos and threats of war. The power to bring this about is in the hands of our nation's leaders and the citizens of the United States have the right to expect them to do what is best for our nation and not what will get votes and reelections.

New Getchell mill in Nevada will treat 1500 tons per day from extensive reserves of sulphide ore

Economic Forces Alter Price

What of the price of gold? The wave of currency devaluations, set off by England slashing the pound value, has intensified the question as to what will happen to the price of gold, now fixed by the United States Treasury at $35 per ounce.

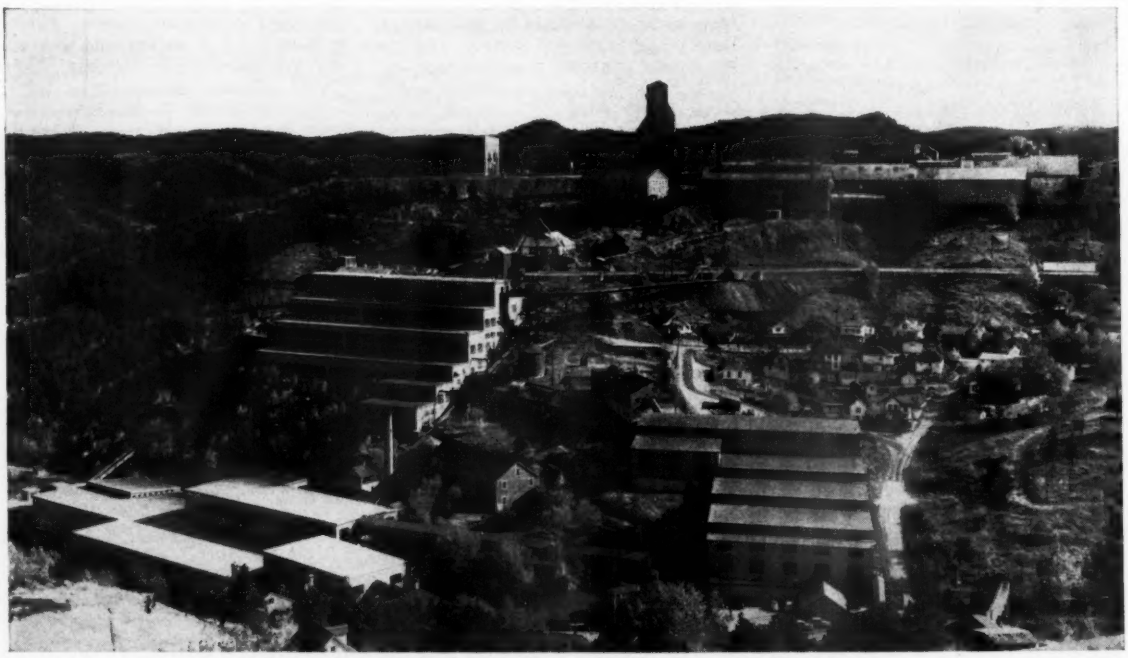
History repeats itself. One fundamental must always be kept in mind: Debt accumulates faster than wealth, and to offset this debt, outstanding currency from time to time has been devalued by increasing the gold price. Through history the price of gold has consistently increased. It is interesting to record a study of the London gold price during the period 1250 to 1940 A. D. In 1250, the price of gold was 17 shillings ($3.90) per ounce. This was gradually raised following the Black Death Plague in 1349. It was again increased during the reign of King Edward IV, when he debased the currency by clipping off the edges of coins to secure funds to carry on the War of Roses. It was increased again by Henry VIII to offset the expense of his luxurious courts. The price steadily increased until the Napoleonic Wars, when it was again raised to reduce the war debt. It decreased somewhat after the wars, was then stabilized at $20.63 per ounce for many years and was raised to $35 per ounce in 1934, where it has remained to date.

Devaluation of currencies is not new. Ancient kings devalued their currency by clipping bits from silver coins, while maintaining face value by decree. In our own country, history records a series of devaluations following wars. The expression "not worth a continental" originated with paper currency of the American Revolution. Following the Civil War, greenback paper currency was unofficially devalued by the public as much as 70 percent in terms of gold. Germany was the first to devalue through inflation after World War I. Subsequently, France devalued in terms of the pound sterling. In 1933, the United States devalued the dollar 60 percent by raising the price of gold and abandoning specie payment. Despite precautionary steps taken at Bretton Woods, devaluation set in quickly following World War II. We have had a steady list of currency devaluation, Hungary, Greece, the Balkans, China, France, and finally, on September 18, 1949, England, whose action was again followed by a host of other nations. Thus, if history means anything, the price of gold, if conditions remain as they now are, will be raised again.

President Truman, Secretary Snyder, and other leading administration spokesmen have repeatedly stated that the price of gold will not be raised by the United States. However, assurances of men cannot combat economic forces and stem further devaluations which, in terms of gold, must raise its price. History records that one King Canute tried unsuccessfully to stem the tides. It has been calculated that to restore the prewar ratio of gold to the present money supplies of leading countries it would be necessary to raise its price to at least $80 per ounce. Today's yearly tax collections of $50,000,000,000 by the government depend upon maintaining an annual national income of 200 billion dollars. When our national income sinks to 150 or 100 billion dollars the "tax take" will not be proportionately cut and it will then be necessary to finance the government to raise the price of gold. A strong deflationary trend in this country could lead to the same result.

Raising the price of gold even to $55 per ounce, which is below its actual value, would give the United States a profit of 14 billion dollars on the $24,600,000,000 we hold, and other nations a profit of around five billions. Politicians do what is politically expedient, and a windfall of 14 billions of dollars will some day be most tempting, particularly when such a huge sum can be secured without increasing taxes or taking other steps which politicians think might be distasteful to the electorate.

The important decision which our nation faces today is not whether the price of gold will or will not be raised, but the immediate necessity to return to the gold standard. We cannot continue to maintain a free capitalistic system or a free economy without a return to the gold standard and the resumption of a free gold market, otherwise we will continue to adopt unsound economic policies, deficit spending will continue, banking and financial institutions cannot properly function, domestic and foreign trade will continue to be greatly handicapped, and the drift towards a regimented and socialistic economy will continue. It is imperative that our nation return to the gold standard now.



Homestake maintained its position as leading domestic gold producer

Synthesis Gas From Coal*

Synthetic Liquid Fuel Program Looks Ahead

By P. T. MARTIN
Staff Associate
Spencer Chemical Co.

Burning gas emerging from a borehole at the underground coal gasification project at Gorgas, Ala. Combustible constituents erupt in a shower of sparks

KNOWN fuel reserves in the United States were estimated in 1948 to be: 98.8 percent coal and lignite, 0.8 percent oil shale, 0.2 percent petroleum and 0.2 percent natural gas. Thus, it may be readily seen that the nation's basic fuel reserves lie in solid fuels and that fluid fuels represent only "flush production." In order to be prepared for an oil shortage before it becomes a reality, the Federal Government and several private companies have embarked upon synthetic liquid fuel programs. These include the investigation of oil shales, natural gas, and coal as raw materials. Congress has appropriated some $60,000,000 to the development of synthetic liquid fuels. The Bureau of Mines is concentrating on the utilization of coal and oil shales and the investigation of the use of natural gas has been left to private industry.

During World War II, Germany found it necessary to supplement her meager petroleum supplies with synthetics. The two processes utilized in making synthetic liquid fuels from coal were the Bergius (hydrogenation of coal) method and the other was the Fischer-Tropsch (hydrogenation of carbon monoxide). At the close of the war Germany was supplying 30 percent of her war needs with synthetic liquid fuels.

Since the discovery of artificial gas by Van Helmont in 1609, the fundamentals of producing gas from coal have been developed to a high degree in Europe. At the beginning of the nineteenth century gas was used for illumination in England and was produced as a by-product when charring coal to coke in the absence of air. In addition to the use of coal gas "coke-oven gas," consisting mainly of hydrogen and methane, and "producer gas," made by partial combustion of coal or coke with air, came into use. In 1873, the United States made its only major contribution to the field of manufactured gas by producing "water gas" made by blasting red-hot coal, coke, or carbon with steam. This was upgraded to "city gas" by the addition of a spray of petroleum oils to crack gaseous hydrocarbons.

United States Developments

It has been since the war that this country has started investigating, on a large scale, synthetic liquid fuels and, thereby, new methods of coal gasification. Allied teams followed the troops into Germany and thoroughly examined plants and research development work done there. Much information has been collected and made available for study and evaluation. The United States now has what is probably a more extensive development program going on than any other country in the world. By starting where Germany stopped, this development should put America far ahead in the field within a few years.

Experimental vortex unit for gasification of powdered coal

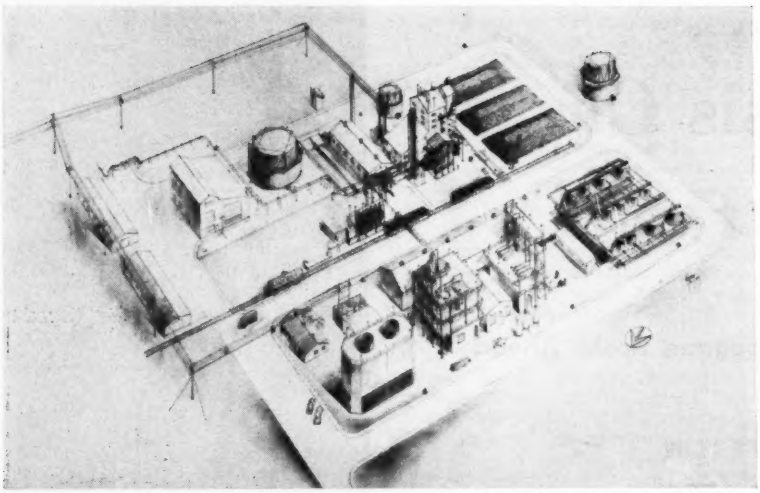
Synthetic liquid fuel research activities in this country have been located for convenience. Some are near raw material sources, and others have been installed where facilities existed that were easily adapted to certain stages of the program. The Federal Government has allocated some $60,000,000 to the development of synthetic liquid fuels and the President's last budget recommended $31,000,000 more for this purpose in fiscal 1950. Two bills have been introduced which would allow loans to industry for the construction of plants to produce gasoline and oil. Three raw materials are being considered in the program—oil shale, coal, and agricultural residues. Of these, coal has received the most attention and is the only one considered here.

Fundamental Research

At Bruceton, Pa., most of the U. S. Bureau of Mines research on the Fischer-Tropsch synthesis and coal hydrogenation are being carried on. Investigations fall into two broad classifications—catalyst testing and pilot plant studies.

The Central Experiment Station in Pittsburgh has a Vortex gasifier with which experimental work is being car-

* An extract of a report presenting the details of all processes tried or under development.



Perspective sketch of the Bureau of Mines Gas Synthesis Demonstration Plant at Louisiana, Mo.

ried out. The station is also engaged in evaluating captured German documents on Fischer-Tropsch, coal hydrogenation, and coal gasification.

The Vortex reactor is designed for the combustion of 100 lb of powdered coal per hour and is unique in that the heat evolved per cu ft per hour is about 100 times that of other combustion devices. Mixed oxygen and superheated steam are introduced tangentially in the cylindrical combustor through peripheral slots at velocities of about 50 ft per second. Powdered coal is introduced into the gas stream from the top of the reactor and will, in the near future, be introduced horizontally. Uniform coal feeding is one of the biggest problems in operating the reactor. As the coal particles are gasified, they become smaller and move toward the center of the chamber. Reaction products leave through an opening at the bottom of the chamber and are quenched with water.

Bureau of Mines synthesis gas production laboratories are located on the campus of the West Virginia University, Morgantown, W. Va. Work is being carried on by means of providing basic data for the design of large plants to produce hydrogen and synthesis gas from all types of domestic coal at low cost. The work is divided into three sections; a pulverized fuel gasification section; an underground gasification section; and a gas treating and testing section.

Two pilot plants are being operated that gasify pulverized coal. One is on a laboratory scale, the other is on a pilot plant scale. The pilot plant unit is set up to gasify 1000 lb of pulverized coal per hour. The generator is a steel shell 26½ ft high and 102 in. in diameter lined with refractories down to a 39-in. internal diameter. The reactants enter the bottom of the generator tangentially. They are aimed at the circumference of a 2 ft diam circle in the center of the reactor. The coal (80 per cent minus 200 mesh) is entrained in the reacting gases, and the mixture is gasified as it moves upward with a swirling motion. The "make" gas is withdrawn from a side port near the top.

From the generator, the gas is passed through two batteries of stainless steel cyclone separators where ash and unreacted coal are removed. The gas is then washed with water in spray and packed towers and passes through an exhauster to the holder. Future work at this laboratory is planned to work out the best method of injecting reactants, to study slag deposits and removal, and to improve dust removal from the gas stream.

A pneumatic feeder developed at Morgantown is rather unique and applicable to coal and other finely divided solids. The gas is passed upward in a chamber and through the coal bed to fluidize the coal. If a positive pressure is maintained in the chamber, the fluidized coal may be easily pushed through delivery tubes. To superheat the steam to temperatures of 3000 to 4000 F, two Royster type pebble stoves are used intermittently. In operation, the gas and air for heat generation come in at the top of the regenerator type stove and combustion products leave at the bottom. On the steam-heating cycle, the steam is introduced through the bottom ports and withdrawn from a side port near the top.

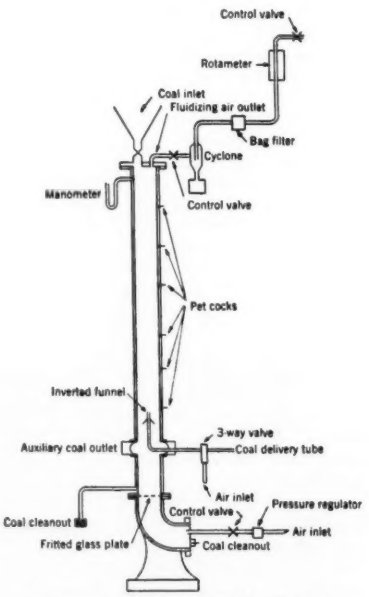
Synthesis gases produced from coal requires further processing and purification. A purification pilot plant is being constructed at Morgantown. In this unit, dust will be removed mechanically and carbon dioxide and hydrogen sulfide by the amine absorption system. Some new catalysts are being investigated which show promise to remove both organic sulphur and hydrogen sulfide.

Liquid Fuel Plants

At Louisiana, Mo., two synthetic liquid fuel demonstration plants are being built. A 200-300 bbl per day hydrogenation plant and an 80-100 bbl per day Fischer-Tropsch plant will be used to test American coals, equipment and methods. Techniques and results of research from Bruceton and Morgantown will be used in these larger scale installations.

A $10,000,000 plant following the basic design of German plants using the Bergius process is now ready for operation. Many improvements have been made over the efficiencies of a typical German plant.

Since chemically, crude petroleum contains more than twice as much hydrogen as does coal, it is necessary to add hydrogen to coal to produce gasoline. This is done in two steps at about 700 atmospheres pressure. The first, or liquid-phase hydrogenation, liquefies the coal; the second, or vapor-phase, converts the liquefied coal to gasoline and by-products. The versatile process will produce oils ranging from high-octane aviation gasoline to heavy fuel oils and jet fuel.



Pneumatic feeder for finely divided solids

Gas Synthesis Plant

A $5,000,000 Fischer-Tropsch plant is under construction which will consist of four distinct parts: coal gasification; gas purification; hydro-carbon synthesis; and product refining. Coal gasification facilities have been completed and placed in operation.

The demonstration plant is scheduled for daily production of about 55 bbl of finished gasoline; 10 bbl of Diesel oil; 12 bbl of heavy oil and

waxes; and 5-10 bbl of propane. This process is not at present economical for the production of high-octane aviation gasoline, but produces suitable fuel for automobile and Diesel use. The synthesis converters in the process used at present are not economical for the production of high-octane aviation gasoline, but produce suitable fuel for automobile and Diesel use.

The coal gasification plant consists of an oxygen production unit; coal-handling equipment; process steam superheater; and the gasifier proper. The oxygen unit is a Linde-Frankl brought from Germany which will produce one ton of 98 percent pure oxygen per hour. Coal-handling facilities will dry, grind and pulverize coal to approximately 200 mesh. This pulverized coal is carried by air to storage bins. It is hoped that no particular type of coal will be required for gasification in the converter designed to handle 2300 lb of coal per hour.

Gas produced by the process is passed through a cyclone separator in a washer-cooler to remove dust and is then compressed prior to removal of hydrogen sulphide and sulphur.

Two types of converters—an internally cooled unit and a slurry unit—are used. A catalyst converter will produce perhaps 80 bbl of product per day. The slurry reactor containing finely divided iron catalyst produces, like the internally cooled unit, a liquid which must be distilled and given further treatment depending upon the type of product desired.

Preliminary design work and cost estimates have been made for commercial-size plants using both coal-hydrogenation and gas-synthesis processes to produce liquid fuel. A survey is now being conducted to determine the best regional sites for synthetic liquid fuels plants.

Experimental work has been carried out by the U. S. Bureau of Mines on gasifying lignite and subbituminous coal at Golden, Colo., and at Grand Forks, N. Dak. The object of the experiments was to produce a high-hydrogen gas from North Dakota lignite to reduce Minnesota low-grade fine iron ore. The Golden plant was placed in operation in 1944 and the Grand Forks plant is approximately completed now.

Gasification of Coal in Place

The first test conducted near the Gorgas mine of the Alabama Power Co. in Walker County, Ala. was conducted to determine if combustion of coal as it exists in the coal bed can be maintained and controlled; if coal in place can be completely gasified; and the effect of the gasification of coal in place upon the overlying strata. This test, well described in technical journals, accomplished its objectives.

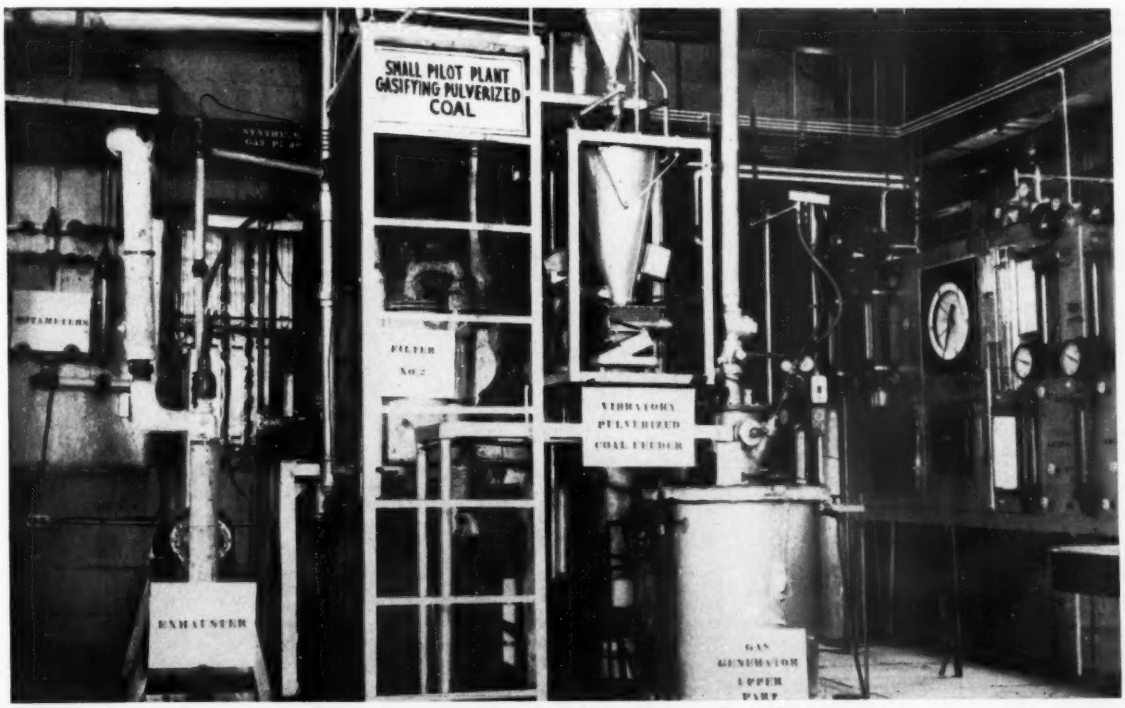
In areas where combustion had been completed, only ash and clinker remained indicating that coal can be completely gasified in place. High temperatures caused changes in the overlying strata which appeared favorable to the process. The roof-rock became plastic and settled and expanded in the crosscut closely following the reacting coke face. This forced the gases to flow close to the coke face, rather than by-passing it, and increased utilization of the blast components. Coking of the coal in a thin layer preceded actual combustion.

From the results of this experiment an estimate was made covering the development and operation of a project to gasify 500 tons of coal per day for over ten years. The product was assumed to have a heating value of 125 Btu per cu ft for use in power generation. The cost came out as $2.33 per ton of coal gasified, or equivalent in energy production to coal at $3.40 per ton or natural gas at $0.137 per 1000 cu ft.

The outcome, and later investigation at Morgantown, indicated the desirability of conducting further experiments in the field. Consequently, the Bureau of Mines and the Alabama Power Co. have undertaken a second joint test at Gorgas which is in progress at the time of this writing (See MINING CONGRESS JOURNAL, May 1949). Planned to obtain fundamental engineering data for future development work, its objectives are:

(1) To determine the quantity of coal that can be gasified from a given initial combustion zone and the shape and extent of the burned-out area formed by this gasification.

(2) To determine the practicability of fixed product-gas outlets both at the outcrop of the coal bed and at vertical boreholes. It is the intention to test various designs of



Section of a small pilot plant for gasifying pulverized coal

inlets and outlets, including the seals required.

(3 To determine the operational characteristics of the experimental installation under such variation of conditions as the nature of the installation and the progress of the work may indicate to be desirable. For example, the length of passage required, the optimum rate of flow, and the pressure drop encountered.

(4) To determine the quality and quantity of the air-blow product gas generated under the experimental conditions. A secondary phase will be determination of the quantity of tar and related products obtained.

(5) To obtain all possible information regarding the action of heat on the overlying strata.

(6) To obtain such fundamental technical and economic information having influence on the choice of plant sites, plant installation and operating processes as can be realized without interfering with the foregoing objectives. This will include the testing of refractory linings, together with the installations designed for handling hot gases.

Underground Gasification Tests

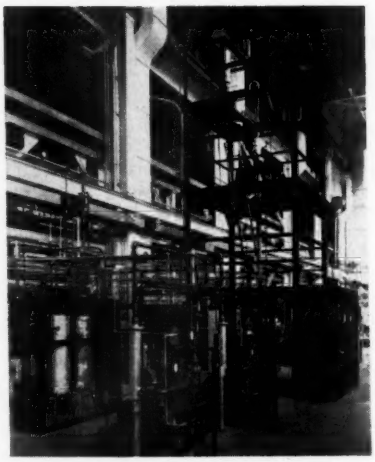
Some of the problems connected with the underground gasification of coal are being investigated at the Morgantown laboratory at a fraction of the cost of field experiments, which are going ahead at Gorgas, Ala. A unit has been set up and operated in various ways to simulate conditions existing in underground gasification tests. Gas produced in one test run had a heating value of 111.6 Btu per cu ft. Further tests are being conducted. Pilot work is being planned in cooperation with a Belgian organization to utilize superheating steam and oxygen.

Other Developments

The Pittsburgh Consolidation Coal Co. and the Standard Oil Development Co. have cooperated in erecting and operating a $500,000 pilot plant at Library, Pa. to produce gas from pulverized coal, oxygen and steam in a fixed-fluidized-bed—probably in apparatus similar to a Winkler generator. The gas may then be used as a fuel or it may be converted to synthetic liquid fuels and chemicals.

The Consolidated Mining & Smelting Co. of Canada, Ltd. has been gasifying coke with oxygen on full-scale production of ammonia synthesis gas at Trail, B. C. The test observed utilized anthracite in both rice and barley sizes to produce gas for ammonia synthesis. One short test produced a gas with an average heating value of 305 Btu per cu ft from rice anthracite.

A continuous process for gasifying entrained pulverized coal and lignite in an externally heated alloy tube has been sponsored by the Bituminous Coal Research, Inc. Coal, entrained in steam, passed downward through a metal tube heated externally by gas. The gas produced was filtered and washed to remove dust and for cooling. Hydrogen plus oxygen ran about 80 percent of the "make" gas from noncoking coal. An investment cost of $82 per cu ft per day capacity was estimated. This figure compares with one of less than $40 for conventional carburetted water gas and it was concluded that commercial development of the process was not warranted.



Gas synthesis (Fischer-Tropsch) internally-cooled pilot plant at Bruceton, Pa.

The Carbide and Carbon Chemicals Corp. has purchased rights to the coal under about 30,000 acres of land northwest of its South Charleston, W. Va. plant and is experimenting there with underground gasification. It is also known to be working on the hydrogenation of coal. The purpose may be to use the gas from underground to hydrogenate coal and produce hydrocarbons for use as raw materials. No details of the experiments are known.

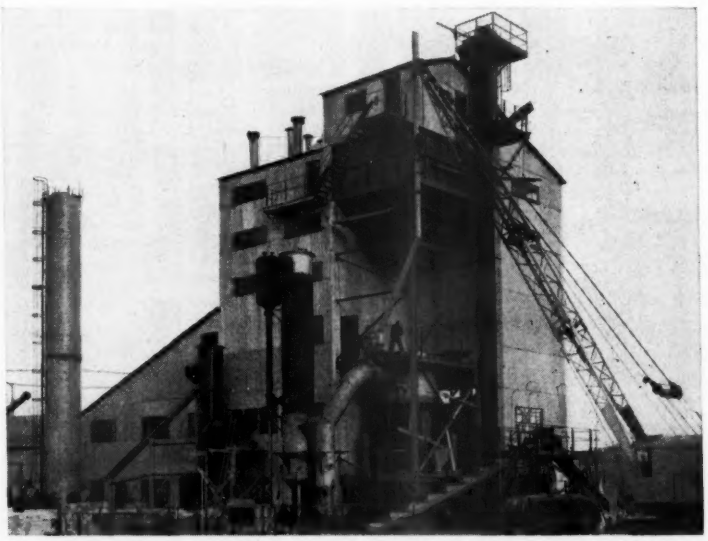
Conclusion

As a result of the critical evaluation of the literature on coal gasification, especially German documents and reports of teams sent to inspect German facilities, the U. S. Bureau of Mines appears to favor continuous gasification of powdered coal in the entrained state, as in suspension with oxygen and steam. These processes are expected to be applicable to all types of domestic coals. New means of superheating steam may considerably reduce the oxygen requirements and the cost of gas.

To maintain good gasification efficiencies and keep methane formation at a minimum, high reaction temperatures are favored. Therefore, coals with low ash-fusion points would be best suited for use in systems in which the ash can be withdrawn as a molten slag. Entrainment-type gasifier can be so designed and operated. Low ash-softening coals are said to cause difficulties in fixed-fluidized-bed systems such as the Winkler. High sulphur coals would be expected to increase the gas purification cost.

Because of expected over-all versatility and high temperature operation, the suspension systems being tested at Morgantown and Louisiana are thought best suited for domestic and commercial installation. With present oxygen prices, the opinion has been expressed that synthesis gas is available today at about 15 cents per thousand cu ft from coal at $2 per ton.

Underground gasification may offer future economic advantages but will require more development before being proven as a source of high calorific fuel or synthesis gas.



Coal gasification unit at Louisiana, Mo., will supply carbon monoxide and hydrogen for synthesis

Truck hauling strip ore from the Buckeye mine of the M. A. Hanna Co.

Iron Ore

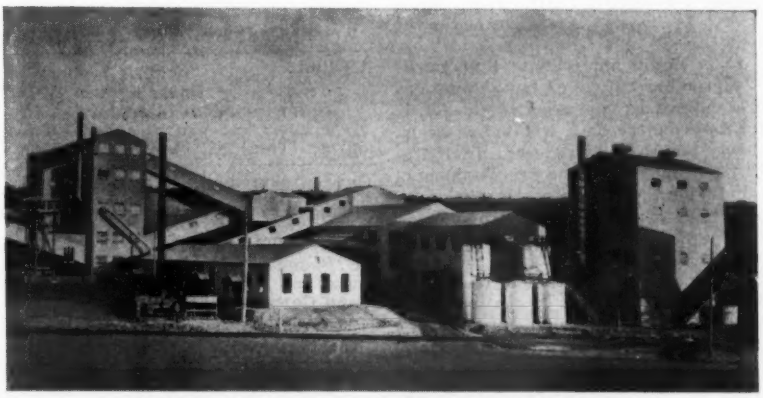
Domestic Shipments Off—Imports Increase as Foreign Developments Proceed

By A. L. FAIRLEY, JR.
Assistant to the President
Snyder Mining Company

SHIPMENTS of iron ore from the various iron mining districts of the United States in 1949 amounted to approximately 84,800,000 gross tons. This compares with 101,470,000 tons in 1948, and 93,660,000 tons in 1947. The shipments from the Canadian side of the Lake Superior district amounted to 1,762,092 tons. Although shipments from U. S. mines declined in 1949, the Canadian shipments increased substantially. Steep Rock mines shipped 1,134,477 tons compared with 686,385 last year and the Michipicoten District shipped 627,615 against 522,063 in 1948. The general decrease in U. S. mine production for 1949 was due mainly to the coal and steel strikes, and, to some extent, to the midyear slowdown in business activity. Total shipments of ore from all districts were lower than had been anticipated at the first of the year. Table I shows iron ore shipments by producing districts of the U. S. for the last five years.

The last cargo of lake ore was loaded at Escanaba, Mich., on December 12, and the total lake movement (including Canadian) for the season amounted to 69,556,269 tons. An additional 1,350,000 tons was moved by rail, to bring the total shipments from the Lake Superior districts to 70,906,269 tons. This was 13,786,741 tons less than the 84,693,010 tons moved in 1948. Table II presents pertinent, comparative facts with respect to the shipments, consumption, and stocks of Lake Superior ore for the last five years, and Table III shows the shipments from each individual Range.

Since the major part of the American iron and steel industry is dependent on Lake Superior ore, everyone connected with this phase of the business is always interested in the status of the lower lake stock piles, and whether or not they are adequate to see the industry through until the opening of the navigation season in the spring. There seems to be no real cause for worry on this score. On December 1 there were 44,786,469 tons



Near Aurora, Minn., the Erie Mining Co. beneficiates taconite

TABLE I

SHOWING IRON ORE* SHIPMENTS BY PRODUCING DISTRICTS OF THE UNITED STATES, IMPORTS AND EXPORTS

District	1945 Millions Gross Tons	1945 % of Total	1946 Millions Gross Tons	1946 % of Total	1947 Millions Gross Tons	1947 % of Total	1948 Millions Gross Tons	1948 % of Total	1949† Millions Gross Tons	1949† % of Total
LAKE SUPERIOR Minnesota, Michigan and Wisconsin	75.96	85.35	59.67	84.40	77.98	83.26	83.5	82.3	69.1	81.49
SOUTHERN—Mainly Alabama, Georgia, Missouri and Texas	6.66	7.48	6.60	9.34	8.23	8.79	9.2	9.1	8.0	9.43
EASTERN New York, Pennsylvania and New Jersey	3.62	4.07	2.25	3.18	3.77	4.02	4.5	4.4	3.8	4.48
WESTERN—Mainly Wyoming, Utah, California and New Mexico	2.76	3.10	2.18	3.08	3.68	3.93	4.3	4.2	3.9	4.60
TOTAL	89.00	100.00	70.70	100.00	93.66	100.00	101.5	100.0	84.8	100.00
IMPORTS	1.19		2.82		4.9		6.1		7.5	
EXPORTS	2.06		1.51		2.8		3.1		2.4	

* Exclusive of "by-product" pyrite cinder and sinter from various sources
† 1949 partially estimated; subject to adjustment when final figures are sent in
Above figures include manganiferous iron ore from the Lake Superior District

of ore on hand at furnaces and lower lake docks. Lake shipments during December, plus the all-rail shipments that will continue during the winter, give a total available supply of approximately 45,300,000 tons to carry the industry through the winter. Assuming average consumption of 7,400,000 tons per month from December through March, which represents near capacity operation, it appears that there will be available about 15,700,000 tons on April 1, 1950. This represents over two months' supply and compares with 17,308,374 tons on hand April 1, 1949 and a low of 13,554,803 tons on May 1, 1947, the lowest point reached in recent years. Although total stocks are not in direct proportion to requirements of the individual companies, there should be adequate over-all supplies for the winter of 1949 and 1950, even if inclement spring weather should cause a late opening of the navigation season.

Lake Region Continues as Major Ore Source

It is significant to note that since 1942, the percentage of Lake Superior ore shipped as compared to the total for the country as a whole, has been slowly but steadily reduced. In 1942, 87.1 percent of all iron ore shipments came from the Lake Superior district, and in 1949 this rate had dropped to 81.5 percent. New steel industry developments and expansions in parts of the country not dependent on Lake Superior ore, and the increasing tonnage of imports account largely for this decrease in the Lake Superior district's participation. This general trend will probably continue for some time, but in spite of this, and notwithstanding the numerous non-technical articles recently written concerning this subject, the Lake Superior district will continue to supply the major share of the iron ore used in this country for many years to come.

Reserve ore tonnages, as determined by tax authorities each year for property evaluation purposes, cannot, by their very nature, be considered as a final measurement of total recoverable ores. These estimates are developed specifically for the purpose of determining values of mines for ad valorem taxation. They are subject to change and revision each year. As new exploration proves up additional ore and new mining and beneficiation techniques make merchantable products out of material previously not economically recoverable, then these additions are added to the taxable tonnage. Therefore, as past records indicate, these estimates cannot be used to reflect all the ore that the district may produce after the date on which they are effective.

For more than 30 years past, the average annual decline in Lake Superior reserves has been about one-

TABLE II

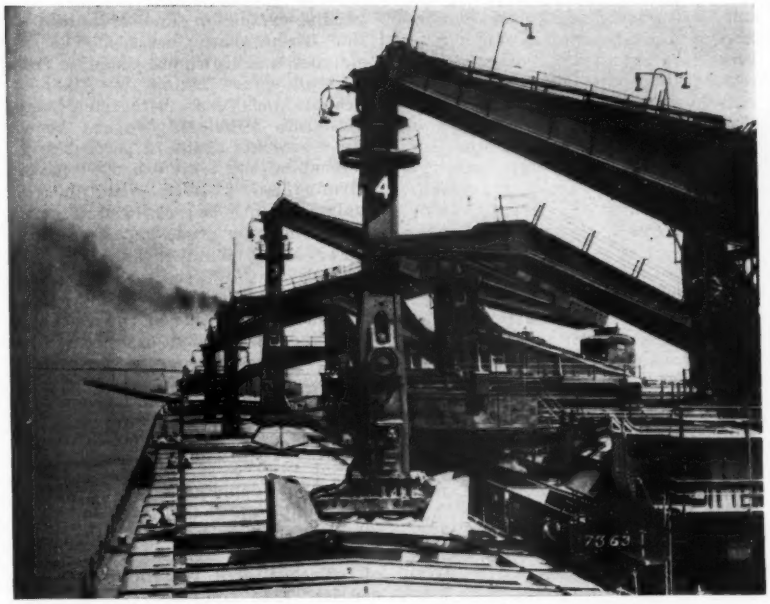
TOTAL LAKE SUPERIOR IRON ORE SHIPMENTS, CONSUMPTION AND STOCKS ON SIGNIFICANT DATES

(Thousands of Gross Tons)

	1945	1946	1947	1948	1949*
Shipments					
By Lake					
From U. S. Ports	75,110	58,096	76,258	81,739	67,797
From Canadian Ports	605	1,277	1,621	1,201	1,759
Total By Lake	75,715	59,373	77,879	82,940	69,556
All Rail					
From U. S. Mines	1,209	1,492	1,723	1,745	1,347
From Canadian Mines	57	164	83	8	3
Total All Rail	1,266	1,656	1,806	1,753	1,350
Total Shipments Lake and Rail	76,981	61,029	79,685	84,693	70,906
Consumption U. S. and Canadian Furnaces	74,576	62,093	80,807	80,604	71,500
Stocks on Hand—at U. S. and Canadian Furnaces and Lake Erie Docks on May 1.	16,429	23,079	13,555	17,125	17,803
On December 31	39,059	37,465	36,095	39,460	37,600

* 1949 figures partially estimated
Source—Lake Superior Iron Ore Association

third of the tonnage shipped, this shows that new discoveries and expansions by development, by improved technology, and by new and more efficient operating techniques have contributed to the reserves in the past. No one expects such a high proportion of replacements of high grade ore in the future, but certainly the tonnage to be added may be substantial. Unfortunately, reserve tonnages of present commercial ores readily available to each consumer are not proportionate to the needs of each, and could not be expected to be. Neither are the reserves that can be easily mined by open-pit methods proportionate to the tonnages that have been produced from open pits heretofore. Since 1940 the open pits of the Lake Superior district, mainly on the Mesabi Range, have supplied 78 percent of the total output of the district, whereas only a little over ½ of the known reserves are classed as open-pit ores. However, better means of stripping and mining, and the constantly increasing costs of underground operations have tended to reclassify as open-pit ores, considerable tonnages of former underground reserves.



Automatic equipment unloads Mesabi ore at Conneaut, Ohio

Beneficiation Increases

The industry as always, is looking far ahead in making its preparations to meet whatever demands may develop. Since the end of the war, exploration in Minnesota, Wisconsin, Michigan, and Western Ontario has been proceeding at a rate unequalled since the early days of the Lake Superior ranges. In addition to exploration for new properties, recent advances in washing, jigging, and heavy media separation have made available for the market, large tonnages of intermediate and lean ore which were previously unmarketable.

Twenty years ago only 14 percent of all the ores shipped from Minnesota were beneficiated, whereas in 1949, approximately 26 percent were improved by some method of beneficiation. Each year sees new plants being built, and put into operation, and it is only through constant experimentation with new methods and techniques that the grade of ore shipped has been maintained at its present level. The beneficiation of the taconites (which represent the largest reserves of iron-bearing material in the district) is being attacked from every angle, and the large amount of money and effort being expended by the companies in this direction will, it is hoped, result in the utilization of large quantities of this material in the future.

Many of the large companies have laboratories devoted exclusively to iron ore beneficiation, and two companies have built production-size pilot plants to overcome various problems connected with the upgrading of taconite. However, only one of these plants is located in the Lake Superior region, the other one being adjacent to a consuming steel plant.

Under the sponsorship of ten different mining companies, the Battelle Memorial Institute has been working for six years on the basic scientific approach to this problem. Everyone connected with the steel industry, and indeed, everyone in the whole country, should have a keen interest in the work which is being done to make a satisfactory and economical ore from this low grade material. It must be remembered, however, that ore made from taconite is really a manufactured product and will require the expenditure of enormous amounts of capital simply to build the necessary plants. Furthermore, due to the fact that nearly three tons of crude ore will have to be mined in order to make one ton of concentrate, and since it

TABLE III

SHIPMENTS FROM THE VARIOUS RANGES OF THE LAKE SUPERIOR DISTRICT BY LAKE AND ALL RAIL*

(Thousands of Gross Tons)

	1945	1946	1947	1948	1949*
U. S. Ranges					
Mesabi	58,369	46,326	59,079	64,047	53,546
Vermilion	1,446	1,330	1,430	1,560	1,285
Cuyuna	3,016	2,354	2,860	3,149	2,056
Fillmore County, Minn.			148	353	102
Total Minnesota	62,831	50,010	63,517	69,109	56,989
Gogebic	4,304	3,718	5,253	5,384	4,325
Marquette	4,585	3,270	5,543	4,898	4,216
Menominee	4,241	2,590	3,668	4,094	3,614
Total Michigan-Wisconsin	13,130	9,578	14,464	14,376	12,155
Total U. S. Ranges	75,961	59,588	77,981	83,485	69,144
Canadian Ranges					
Michipicoton	515	610	498	522	627
Steep Rock	505	831	1,206	686	1,135
Total Canadian	1,020	1,441	1,704	1,208	1,762
Total Lake Superior	76,981	61,029	79,685	84,693	70,906

* 1949 estimate subject to adjustment when final figures are sent in
Source—Lake Superior Iron Ore Association

must be ground to minus 200 mesh and then agglomerated after it has been concentrated; the operating costs will also be high.

With these adverse factors to overcome, it will be necessary that industry, labor, and the tax authorities, both Federal and State, cooperate closely in order to make this product competitive with the recently-discovered, high grade ore bodies in Canada and Venezuela. An atmosphere of incentive must be created and maintained, and if this is done there is not much question but that beneficiated taconite will be used substantially in the forseeable future, and eventually will represent a large part of the total shipments from the Lake Superior District.

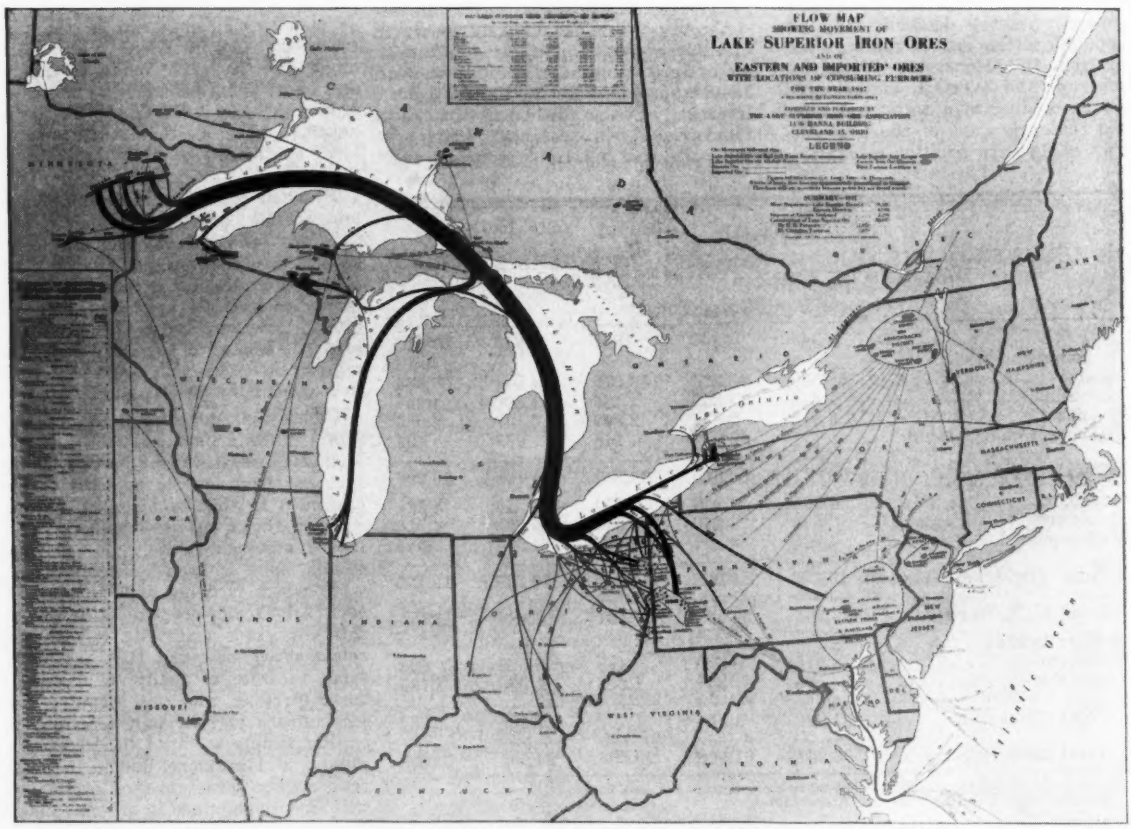
Southern Production Down

Iron ore mining was active in all of the other districts of this country during 1949 also, but just as in the case of the Lake Superior district, their shipments were lower than they were for 1948. In the South approximately 8,000,000 tons were shipped, whereas in 1948, the figure was 9,212,378 tons. As is usually the case, Alabama was by far the largest producer, and a major part of the ore was red hematite produced from the underground mines on Red Mountain in the Birmingham district. The remainder was brown ore produced from open-pit mines mainly in Alabama, Georgia and Texas, with some hematite from Missouri. Washed brown ore represents about 12 percent to 15 percent of the total ore used in the Birmingham district, with the remainder being red ore and a small amount of high grade imported ore.

For many years it has been the practice in the Birmingham District to grade the high lime red ores from the southwestern end of the ore fields with the high silica ores from the northeast end in order to work out a composite grade as near to a self-fluxing ore as is possible under existing conditions. However, siliceous ore reserves are far more plentiful than are the reserves of limy ores, so that the rapid depletion of the latter makes imperative, the development of some satisfactory method for the beneficiation of the tremendous tonnages of siliceous ores remaining in this district. One company already has such a plant in operation, and experimental work is being done by other companies which will also be facing this problem in the near future.

The mining and beneficiation of the local limonite and siderite ores of east Texas continued during 1949, but on a scale somewhat reduced from 1948. Both raw washed limonite and calcined siderite were used as furnace feed in this district. The announcement by Lone Star Steel that it plans to build a complete steel plant as an adjunct to their existing facilities will probably insure a steadier operation than had heretofore been thought possible. In southeastern Missouri, the principal output of ore was in the form of a hematite jig concentrate from the Iron Mountain Mine of the Ozark Ore Co. Most of this material was used at Granite City, Ill.

In the northeastern states (New York, New Jersey, and Pennsylvania) the 1949 shipments when compared with 1948, suffered in about the same proportion as occurred in the South. The three operating mines in New Jersey shipped approximately 393,000 tons of ore and the mines in New York and Pennsylvania shipped 3,385,000 tons, resulting in a total of approximately 3,778,000 tons. This compares with 4,491,034 tons last year. The Ringwood Mine in northern New Jersey which was reopened and equipped by the Defense Plant Corp. during the war, is still idle, and it is understood that it is again being offered for sale. A new open-pit magnetite mine is being developed in the Chateaugay District of northern New



Lake Superior iron ore flows east for reduction

York, which will augment the production from the underground workings.

Utah Is Major Western Producer

The iron ore production in the Western States came mostly from Utah, Wyoming, and California, and amounted to approximately 3,900,000 tons during the year. The Eagle Mountain Mine of Kaiser Steel Co. operated on a large scale for the first time this year, and will probably be the major source of ore from Kaiser Steel Co. for a number of years. The ore is high in sulphur, but since a large part of it is being sintered before being charged into the furnace, this factor does not present a serious problem. This company also received a substantial amount of ore from the Iron Springs District of Utah. A lesser amount was received from the Vulcan Mine in California. This property was not operated during the year but shipped from a stockpile accumulated during previous years. Kaiser Steel completed and put into blast their second blast furnace during 1949, and this probably presages a higher consumption of iron ore on the Pacific Coast in the future.

The Colorado Fuel & Iron Corp. received about half of its ore from the Sunrise Mine in Wyoming, and most of the remainder from the Blowout Mine in the Cedar City District of Utah. Minor amounts came from a smaller operation in this same district. The Geneva & Provo furnaces of U. S. Steel, the largest consumers of ore in the West, received all of their ore from this same district in Utah. Western ore reserves appear adequate on the whole, for the requirements of the western steel industry for many years, although the problem of transportation, grading, blending, and utilization of these ores presents some problems.

Ore Imports Reach New High

Total imports of iron ore for the year are estimated at 7,500,000 tons, a substantial increase over last year's record breaking 6,108,754 tons. The largest tonnage, as usual, came from Chile, with Sweden in second place, and Canada third. These imports are partially offset by exports of about 2,400,000 tons mainly to Canada and Japan, with minor amounts to the Philippines, Australia and others. Some Swedish ore, which over the past years has been used mainly in eastern furnaces, has for the past two or three years also been used in the Birmingham district. The steady increase in imports over the last few years is probably an indication of a future trend. The large new ore developments in South America and Canada forecast substantial and increasing tonnages of imports from now on. Hence, as new plants are built to supply the ever-expanding demand for iron and steel products, it seems probable that some of this basic steel capacity will be built along the Atlantic or Gulf seaboards, in order to make most effective use of these foreign ores. However, although the tonnages will be large when compared to prewar standards, nevertheless this country cannot and will not allow itself, from the standpoint of national security alone, to become dependent to any large extent on foreign ores.

Foreign Development Active

Exploration by American companies for iron ore in this country and elsewhere continues at a rapid pace. Nearly every producing district in the United States is the scene of unusual activity with respect to expanding and developing additional reserves. However, the largest new developments are in the foreign fields. Canada is still demanding a great deal of attention from a number of iron ore companies. Additional work in the Atikokan District has increased reserves substantially in the Steep Rock area. A number of other companies have been studying properties throughout western Ontario. Substantial additional reserves have been developed by two companies in the Michipicoten district, and work in this direction is to continue. One company has had geological crews working as far west as British Columbia. There has been additional sporadic exploration in Ontario and Quebec, but the biggest iron ore search in Canada continues to be in the Quebec-Labrador trough, sometimes called the Ungava trough.

The Hanna-Hollinger interests continue to develop additional reserves, and the companies controlling the other concessions in this area have also been active in making preliminary geological studies. The Hanna-Hollinger enterprise however, is the only one so far, that has actually proven tonnages, and it appears that preparation for the mining of ore and the building of the necessary transpotation facilities will move forward in the near future. Announcement has been made that five consuming companies have taken an interest in the development. Canada inevitably will play an increasingly important part in supplying iron ore for both Canadian and American furnaces.

In Venezuela, two large companies are developing deposits of high grade ore. One of these properties will begin to ship ore in 1950 but the other one still has several years of development work ahead of it. Cuba, other West Indian islands, and Mexico are receiving minor attention from iron ore interests. Announcement has also been made that development work will soon be started, and a 40-mile railroad

Lake ore vessels tie up when winter closes shipping lanes

constructed to bring magnetite ore out of the jungles of Liberia.

Private enterprise and initiative, as represented by the stockholders, management and labor of the American iron and steel industry is today showing the same forward-looking and progressive spirit which has carried it to its present preeminent position in the industrial world. The actions of the industry, which speak far louder than words, in continuing to expand capacity since the war by making enormous expenditures for new and improved facilities, are clear evidence that the industry expects to continue to be able to supply its furnaces with iron ore mainly from the traditional sources and by existing transportation and ore-handling facilities, but with increasingly important supplementary supplies from other sources. Thus, Labrador, South America, Sweden, and other foreign fields are to be looked to for the necessary additional supplies needed to ease the increasing burden on the Lake Superior District.

From the standpoint of public and governmental policy relating to iron ore, the important thing is to make sure that incentives to enterprise are enhanced, rather than destroyed; that the heavy hand of taxation be lifted appreciably in recognition of the peculiar risks of mineral exploration and mining; and that the way be kept open for the maximum application of the talents and energies of our people to productive endeavor. Given these assurances, and an atmosphere of competitive activity, there need be no worry about the iron ore reserves for the future.

Coal Preparation from the Sales Viewpoint

Realization Depends Upon Efficient Plants, Correctly Designed and Properly Operated

By H. A. GLOVER
President
Island Creek Coal Sales Co.

THE term "Preparation" is used for a great variety of purposes, depending upon who uses it. A mine superintendent may use it for one operation, a preparation manager for another, a retail coal merchant for another, and a sales executive for still another. For the purpose of this discussion, the word is used to cover everything in the shape of beneficiation that is done to the coal from the seam to the railroad car. Every step and every movement from the seam to the railroad car has its effect on the over-all preparation results—and the methods employed to carry out several steps can have an effect upon the profit and loss statements of the company far beyond the ordinary cost items applicable thereto.

Inherent Quality Versus Preparation

The average coal operator would probably say that the inherent value of the coal in the seam is of primary importance and preparation is of secondary importance. I believe the average sales executive would say that, granted a minable and merchantable seam with reasonable top and bottom conditions and average quality with other seams in the district, coal preparation is more important than the inherent quality of the coal itself.

What do we mean by this statement? Any workable seam of coal which is average for the district in which it occurs has a market value for certain purposes in certain market areas and can participate in such markets if properly prepared. On the other hand, no matter how much better the inherent quality of a seam of coal in any given producing district may be, it would have no general acceptance in the markets without good preparation. In other words, we can market an average coal from any standard seam in any producing district if well prepared, but we cannot successfully market a coal with superior inherent value without good preparation.

Preparation Begins at Face

To cover the subject of coal preparation from a sales executive's viewpoint, I believe we can safely concede that good preparation is essential to successful marketing and turn our attention to the refinements in coal preparation and their effect on the revenues of the company. Referring only to underground mining, we may start with the coal at the face. In many mines where the coal varies in different sections, it is necessary to select the working places with great care in order to maintain an average quality from day to day and month to month. In other mines, there is soft fire-clay bottom or a rash at the bottom that requires the greatest care in cutting to avoid loading either fire-clay or high ash material with the good coal in the working place. In still other mines, we have a tender roof or top condition that requires leaving a certain proportion of the coal at the top of the seam. This is done by cutting at the top instead of at the bottom.

Preparation Affects Realization

A careful study of the method of shooting is always in order, as there is a great temptation, in all mechanical mines particularly, to shoot the coal down regardless of the resulting size consist and screen percentages. In these days and in recent years in certain producing districts, there has been a difference of anywhere from $2 to $3.50 per ton in the selling prices of certain plus 2-in. sizes as compared with certain minus 2-in. sizes from the same mine. Proper placing of holes, drilling holes the same depth as the kerf, and proper dusting of the kerf are means of improving loadability of coal without blasting it to bits and at the same time preserving or increasing the percentage of the plus 2-in. sizes.

We have all heard the old wheeze so often that the operating man can lie awake nights trying to find a way to save 2¢ or 3¢ per ton in cost of mining, while the salesman gives away 25¢ per ton and goes to bed with a clear conscience. This wheeze might be reversed to say that there are many, many salesmen who lie awake nights wondering how they can get block coal for their customers at a top price, while the operating man gaily shoots his block coal down to nutslack, which may bring from $2 to $3.50 less per ton, and still sleeps at night with a clear conscience.

Although I have no desire to minimize in the least the value of efficient mining and saving every possible cent in the cost of production, I am convinced that lowering preparation standards is a very poor way to reduce production costs or avoid capital expenditures. There are, in some mines, opportunities through better preparation to add as much as 25¢ per ton to the income from mine run coal without increasing the mine cost over 4¢ or 5¢ per ton.

Loss in Revenue Through Oversized Screens

Following the coal from the working place, we frequently find dumping devices and conveyors that increase breakage unnecessarily. We also frequently find oversized screens that reduce the percentage of the higher priced sizes. In some instances oversized screens are installed because of inability to do a good job of screening and in others because of the complaints of the sales department on the size of the coal. It should be possible to eliminate either of these reasons—the first by better screening equipment and the second by less alacrity on the part of the salesmen to be perturbed by all of the odious comparisons they receive from customers, some of which may be justified and others may not.

I should like to make it perfectly clear that these general statements do not apply to all mines nor to all operating men nor to all salesmen—I am simply pointing out various ways in which preparation can and frequently does affect the profit and loss statement.

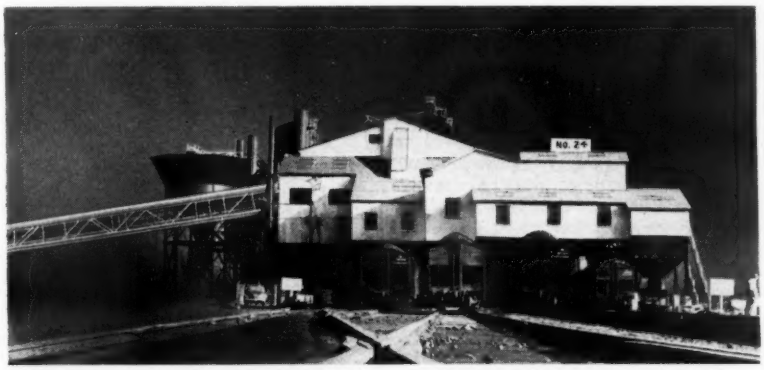
Effect of Oversized Coal on Realization

Perhaps one more example might be in order. When small household stoker coal first became popular, a market for the slack that was removed from the stoker coal had to be developed. Almost immediately salesmen were ad-

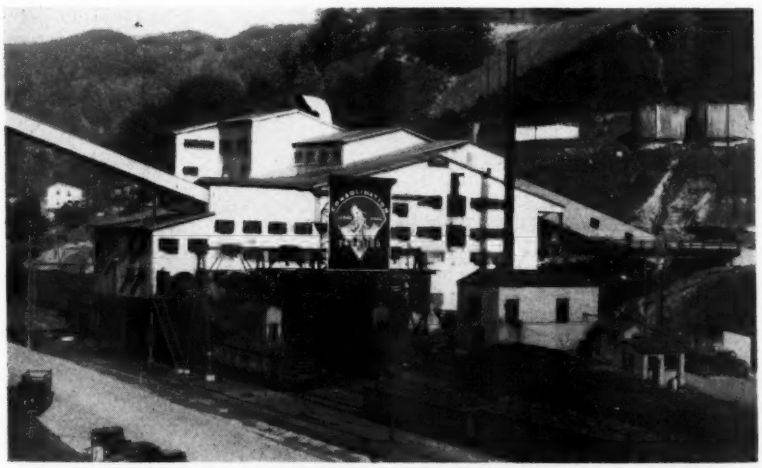
vancing the argument that their small material was better than their competitors', because it was "⅜-in. top size" or even larger. This actually led to a classification of so-called "carbon" with a ⅜-in. top size. There are many, many mines that are now removing ⅜-in. carbon with as high as 10-12 percent oversize and the material between this oversize ⅜-in. and a true ¼-in. top size will constitute as much as 8-10 percent of the mine run. Not only the carbon but the stoker coal would be just as good with a well-screened top size of ¼-in. for the carbon and the same bottom size for the stoker coal. It is surprising to find the percentage of material in mine run coal between ¼ in. and ⅜ in. It is still more surprising in the high volatile fields of West Virginia and eastern Kentucky, where millions of tons of stoker coal are made each year, how much difference there is between the selling price of carbon and the selling price of household stoker coal —$3 to $4 per ton is not uncommon. This means that every ton of oversized coal that goes into the carbon costs the producer from $3 to $4 per ton.

Evolution in Sizing of Coal

Coals are naturally prepared for the markets which the producer hopes to serve. At the beginning of the century, mine run, lump, egg and nutslack (in high volatile mines) were about the highest standards known. Even then, the nutslack was a drug on the market. Fortunately industrial stokers developed rapidly and nutslack assumed an important place in our line of coals. It is, indeed, fortunate that this development took place, as the advent of mechanical loading greatly increased the amount of minus 2-in. coal in the mine run coal. Enormous strides were made in the development of burning equipment for all different uses. The coal industry can proudly say that it has kept pace with these developments through the preparation of sizes and grades well adapted to each type of burning equipment. This has resulted in greatly increasing the number of sizes and grades—greatly increasing the difficulty of balancing sizes at the mines—greatly increasing the efficiency in the use of coal, and finally has not only made it necessary for the coal salesman to have a much broader knowledge of the principles of combustion on the various types of burning equipment, but has also increased the educational requirements and training necessary for a successful industrial salesman. It has also brought the combustion engineer into the industrial selling picture in a very important role.



Mine No. 24 of the Island Creek Coal Co., located at Scarlet Glen, W. Va. Capacity: 350 tons per hour. Plant is equipped to receive coal from the mine and also by railroad cars from other mines. 5 by ¼-in. material is wet-washed by means of a combination laundry and a Link-Belt "Simon Carves" jig. ¼ in. by 0 is wet-washed in a Roberts and Schaefer hydrotator and 10-mesh by 0 is rewashed in a classifier. Dust is filtered from wash water by a Bird filter and coal finally thermal-dried in a Raymond flash dryer. Tipple is equipped with blending bins for 2 by 1¼ in., 1¼ by ¼ in. and ¼ in. by 0, which will permit loading minus 2-in. sizes with any size consist required. Plant is equipped to load all conventional sizes and several special sizes.



Central cleaning plant of Consolidation Coal Co., Dunham, Ky. Capacity: 700 tons per hour. Coal is received from mines in the vicinity by 12-ton, 8-wheel mine cars and also by truck from other mines nearby. All coal is crushed to 8-in. top size and the 8 in. by 0 is wet-washed, the coarse sizes by means of Chance cones and the fines over a battery of Deister tables. The fines are dewatered in Byrd centrifuges and then thermal dried in Link-Belt multi-louvre dryers. Preparation plant can make all conventional sizes and some special sizes for consumers of Elkhorn seam coal.

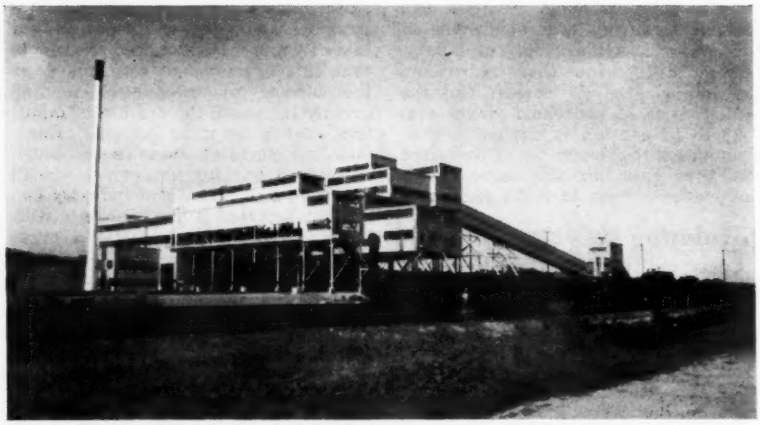
Multiple Sizes for Different Uses

Today a modern, high volatile tipple can and does prepare as high as 20 sizes and grades for specific purposes.

For industrial use, hand-firing has practically disappeared and has been replaced by several types of stokers, such as chain grates, underfeeds, spreader type, etc. Practically all of the larger installations for big consumers use pulverized coal. As such units were converted or rebuilt to burn pulverized coal, we frequently found decided limitations in the pulverizing equipment at the plant and in the flow of the coal. These limitations promptly reflected themselves in sharp restrictions in the size and grade of coal which could be used.

Most modern plants are being built to use a wider range of sizes and grades and, of course, such installations cost more money. There is a definite point beyond which this movement cannot go and be justified by the lower price of coal for several reasons: First, the limitation on the supply of low grade coal and low priced sizes of the better grades of coal and, second, the higher installation costs of such plants. Certain types of stokers have been manufactured and sold with the claim that they would burn the widest possible range of coals, but I believe it is a fair statement that, regardless of the plant and regardless of the type of stoker, the end result, everything considered, still justifies the greatest consideration of strong, high quality steam coals, properly sized.

For industrial plants we now have 2-in. nutslack, 1¼-in. nutslack, ¾-in.



Central cleaning plant of Truax-Traer Coal Co., located at Ceredo, W. Va. Capacity: 800 tons of clean coal per hour. Plant is equipped to receive coal from both C&O and N&W and can load coal into barges on the Ohio River. Coal is brought from all of the company's mines in the Kanawha District to this plant for cleaning. It washes all material between 5 in. and zero and uses Carpenter centrifuges for filtering coal dust from the wash water and drying the coal to a merchantable moisture content. Preparation plant can make all conventional sizes for which coal is suited in the market.

slack, ⅜-in. slack and ¼-in. slack. We also have 2 in., 1¼ in., 1 in. and ¾ in. with all the fines removed. Then we have the same top sizes with a portion of the fines removed. In addition we have 2-in. and 1¼-in. nutslack with additional fines added for certain types of burning equipment. Then, of course, we have the conventional sizes from each district of block, furnace, stove and nut for hand-firing in various types of furnaces, some accommodating a wide range of sizes and others, such as the magazine type, requiring a closely sized coal, such as nut or stove coal.

"Too many sizes," exclaims the operator and operating staff. "No, only those required to reach the highest efficiency in the wide variety of equipment in the industrial plant, the greatest satisfaction to the domestic consumer, and the best average realization for the operator," answers the sales executive. Which one is right can easily be proved, because there are mines of each character in every seam of coal.

Mechanical Cleaning of Coarse Sizes

The advent of mechanical loading made it essential to develop mechanical cleaning. We now have wet-washers and dryers for coarse sizes, some washing from as high as 8 in. down to zero, others from 5 in. to zero, others from 5 in. to ¼ in., etc.

Mechanical Cleaning of Fine Coal

With the general increase in cost of mining and transportation rates and the enormous increase in the tonnage of coal burned in pulverized form, the ⅜-in. by 0 material has become more and more important. Constituting as it does as high as 25 percent of the mine-run product at many mines, it is obvious that this size cannot be completely sacrificed and still hope to obtain enough revenue from the other 75 percent to cover the cost of production and profit for the operator. For many mines this size material is fairly high ash and recent developments in praparation equipment have provided ways and means of cleaning it.

Air-Cleaning Fines

First, the air-cleaner was designed, but this type of cleaner is immediately in trouble when it encounters wet coal. Under the Federal Mine Safety Law, the coal in all dry mines must now be sprayed at the face while being cut. This means excess moisture in the ⅜-in. by 0 material. The air-cleaners have other limitations that the manufacturers are trying to overcome by predrying, by passing material through multiple air-cleaners, and by dividing material into, say, plus 5/32 in. and minus 5/32 in. for separate treatment.

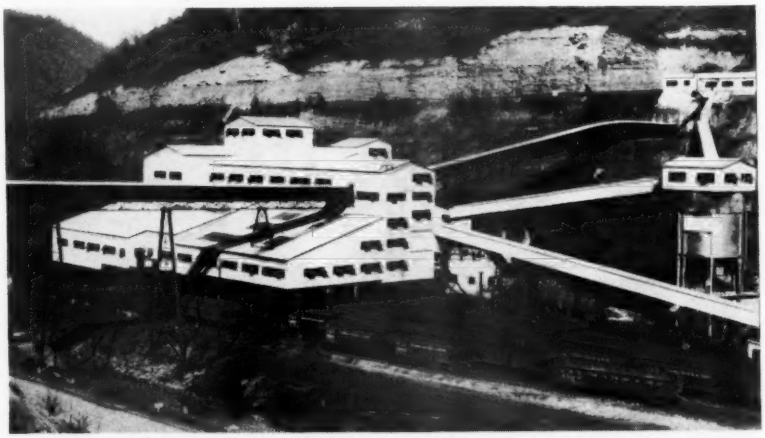
Wet-Washing and Drying Fines

One of the latest developments is the wet-washing of fines. Wet-washing formerly involved wasting the minus 28-mesh material, which was a very serious loss even where physically possible to handle it that way. Likewise, many mines are short of water for washing the entire product and in washing ⅜-in by 0 material so much coal dust accumulates in the water that it cannot be used over and over. This made necessary the development of filters for salvaging the coal dust from the wash water so that the water could be used again and again.

A serious problem in connection with wet-washing small sizes of coal is drying it, as customers object to wet coal. Several modern methods of drying fine coal have been developed and are now in use in certain plants in the United States. These plants will reduce the surface moisture of fine coal from as high as 15 percent as it comes from the washer to 2 percent surface moisture in 20 seconds. Although this equipment is expensive to buy and operate, it salvages absolutely waste material and gives it a high value for many purposes.

General

All methods of cleaning coal are expensive and the smaller the size of the coal the more expensive the clean-



Dorrance Colliery, central cleaning plant of the West Virginia Coal & Coke Corp., located on the company's property in Logan County, W. Va. Capacity: 800 tons per hour. Plant is equipped to receive coal by mine car from three different mines and by rail from any mine. It wet-washes from 7 in. to ¼ in. and dry-cleans from ¼ in. to zero. Since the fines are not wet-washed, the company does not feel the need of heat-drying facilities. Plant can make all conventional sizes for markets to which its coals are adaptable.

ing. The cost of equipment and the process goes up correspondingly as the size to be cleaned goes down.

One most important requirement of good preparation of any small size of coal is the removal of tramp iron or extraneous material of all kinds. There is nothing more exasperating or more expensive to the consumer than tramp iron in coal which can, and often does, do serious damage to pulverizing equipment, stoker worms, etc.

In addition to these requirements, we have dust-proofing, freeze-proofing and identification. These all play a part in modern merchandising.

Face preparation, washing, drying, sizing, blending, freeze-proofing, dust-proofing and everything else that is done to the coal from the seam to the railroad car constitute "preparation."

Mine No. 28 of the Island Creek Coal Co., located on company property in Logan County, W. Va. Capacity: 300 tons per hour. Plant is designed to receive coal from Mine No. 28 by pit car and from two other mines by railroad car. Coal is crushed to 5 in. top size and material between 5 in. and ⅛ in. is washed in a Chance cone. Plus ⅛ in. and minus ⅛ in. material can be loaded separately into railroad cars or the minus ⅛ in. returned partially or wholly to the plus ⅛-in. coal. Coal is entirely for by-product use and needs no sizing facilities. A unit for wet-washing and drying minus ⅛-in. material probably will be added to this plant in the near future.

Typical Modern Plants in the Southern High Volatile Field

Regardless of whether there are too elaborate plants and too many sizes or whether there are not, the fact remains that outstanding producing companies have "plowed back" enormous sums of money into ultra-modern preparation plants. These new tipples and preparation plants are by no means confined to the Southern High Volatile producing districts, but, because the operators in these districts are probably shipping coals to wider markets, both from the standpoint of geography and utilization, I am confining my remarks and conclusions to this producing field. Illustrations shown herein are excellent examples of ultra-modern preparation plants and these particular ones include every type of cleaning, sizing, blending, drying, dust-proofing, freeze-proofing, etc., discussed in this paper. It should be noted here that the size and equipment of any preparation plant depends upon the tonnage to be prepared and the markets the operator hopes to reach. Four of these plants are designed to reach the general industrial, domestic and some special process markets. The fifth one (Island Creek No. 28) is a small cleaning plant with a large capacity to clean mine-run coal from three mines for by-product use.

Conclusion

In conclusion, I cannot resist the temptation to express my conviction that coal preparation, used in the broad sense and covering the various phases outlined above, is the most important factor in the success or failure of any coal company in marketing its product. The capital investment is high—appallingly so—and the same is true of the cost of processing, but the possibilities for greater income, better running time, diversification of markets and better customer acceptance far outweigh any prudent capital expenditure, provided the inherent quality of the coal lends itself to such uses.

It might also be in order for me to acknowledge that the best of plant and equipment and the best of preparation require an equally high standard of marketing to make a successful company. In other words, the science of marketing coal must develop and keep pace with the changing markets and the science of preparing coals must keep pace with the science of marketing and changing market conditions.

Since the changing markets and competition have and will continue to force new and modern preparation, it naturally follows that the sales executive should sit at the conference table when any change in equipment which affects preparation is being discussed. In return for this, the sales executive must see that there is a satisfactory financial return on every dollar of capital expenditure made on his recommendation.

Coal Storage by Compaction

COAL stockpiling in such a manner that fires will not occur has been in use for a long time. In 1937 heavy earth-moving equipment was applied successfully to this problem.

The American Gas & Electric Co. uses approximately 6,800,000 tons of coal annually and its coal is packed to prevent spontaneous combustion. Other methods have been attempted and subsequent fires have been numerous.

The elimination of the fire hazard by spreading coal in thin layers, compacted by the vibration and travel of track-type tractors, has promoted public utilities to design and equip their newest plants for tractor-scraper handling.

In fine coals, because of the greater surface exposed, oxidation takes place rapidly and heat is generated at great speed. On the other hand, sized coals of the larger sizes oxidize more slowly. Compaction of the coal by earth-moving equipment assures that every portion of the pile will be firm and hard and that water will run off readily.

As coal tripped from a bucket or spilled from a conveyor belt onto a pile will segregate with the larger sized elements rolling to the bottom and around the edge of the pile, compaction is the best means of eliminating the hazard of rapid heating and subsequent fire.

Compacting a coal storage pile

Progress Toward A National Stock Pile

By MAJ. GEN. A. B. QUINTON, JR., U.S.A.
Acting Director for Industrial Programs, Munitions Board

THIS status report on the national stock pile of strategic and critical materials really deals with two subjects. Both subjects are of interest to specialists in the production of materials. The first is the progress in buying and storing of materials, a report of progress in the purchasing of a fairly definite set of quantitative objectives of 71 different materials, mostly minerals. The second is the less tangible but no less important matter of planning ways to ensure adequate supplies of all essential materials for wartime industry. Back of this second subject is the still broader problem of planning for industrial mobilization in time of national emergency.

It should never be forgotten that the national stock pile is only one portion of the huge task of industrial support for a war effort. Without a good supply of raw materials, the nation would have great difficulty in mobilizing very much military strength. But in wartime the nation's materials must be effectively allocated if they are not to be dissipated and wasted. The stock pile is thus an integrated part of our defense system, balanced and planned and programmed with other programs, military and civilian, for the national security.

At the present time, material objectives for the national stock pile are valued at about $3.8 billion dollars. We are stock-piling 71 different strategic and critical materials. Materials valued at $1,149,000,000 are on hand and orders are outstanding for materials valued at $416,000,000 more. A year ago total stock-pile objectives were for 69 materials and were valued at about $3.2 billion. And at that time materials on hand were valued at $821,000,000 with another $533,000,000 worth of materials on order.

At the present time we are converting to a set of revised objectives, based on the best and latest available information drawn from a dozen agencies of the Government—both civilian and military. It is, of course, imperative that we constantly review these stock-pile objectives, to make sure that they are based on up-to-date facts. As military requirements change, as industrial consumption patterns change, and as prospective availabilities of materials change, our stock-pile objectives must be adjusted to match. The bulk of the work on revising objectives will be completed during the next six months. We have already completed the review for 11 materials comprising 36 percent of the total value of the stock pile. We expect by next April to have completed the review for materials comprising 93 percent of the total value of the stock pile.

Meanwhile, contract placement is now going ahead at a good rate. During November and December 1949, the Federal Supply Service—the purchasing agency for the stock pile—placed contracts for $92,300,000 worth of materials. That is a pretty good rate, but the stock-pile program got off to a late start on this year's appropriation. Full scale procurement was not undertaken until after October 29. Although a stock-pile appropriation of $835,000,000 in new cash and contract authority had been voted by the Congress in June, the question of stock-pile appropriations was reopened in July and a decision was made final on October 29 to rescind $100,000,000 of contract authority. There were several issues involved in this recission. One was the general effort to balance the Federal budget. Another issue was the use of long-term contracts. The Munitions Board has used long-term contracts for the development of new and expanded sources of supply of strategic and critical materials, and particularly of sources that would be available in time of war. During the years immediately after the war when most materials were still in short supply, the long-time contract was essential to enable any important progress in stock-piling. As most materials have eased, the device has become somewhat less urgently needed. However, it still serves a very real function.

As the stock pile increases in size another problem comes increasingly to the fore, that is the making of all the elaborate provisions necessary for the care of the materials, the rotation of perishables, the locating of stocks so that they will be quickly available to consuming centers, and other matters of warehousing and storage nature.

★ ★

Objectives Under Revision as Strategic and Critical Materials Accumulate

★ ★

A storage plan has been worked out for each material, to enable adequate stocks to be assigned to Government storage depots near consuming centers. A formidable array of storage problems remains to be dealt with, but the basic plan is complete and in operation.

To summarize: the stock-pile program is about half way. The nature and magnitude of the job are clearly defined. The administrative organization has been built to handle the job. The policies have been laid down. Cooperation has been extended by Government agencies and private business. A good part of the materials has been accumulated. The task ahead consists of (1) continued procurement at a maximum rate feasible; (2) continued review and appraisal of stock-pile objectives; (3) constant watchfulness to ensure that all materials truly strategical and critical are provided for, including new materials that are only beginning to find use through technological advances in military equipment and industry; (4) the careful maintenance of our stock piles to prevent loss or deterioration and to ensure the ready availability of our stocks in time of emergency.

Balance Between Manpower and Revenues

The other aspect of the stock-piling program, mentioned at the outset of this article, is a rather broader one. There are several ways of looking at

(*Continued on page* 131)

Anthracite briquets are produced at Locust Summit plant of Philadelphia & Reading Coal & Iron Co.

Anthracite

Labor Strife and Weather Reduce Output

By C. A. GIBBONS
Vice-President and General Manager
Susquehanna Collieries Division
The M. A. Hanna Company

FOUR fields comprise the anthracite producing district situated in Northeastern Pennsylvania. They are termed the Northern, Eastern Middle, Western Middle and Southern fields. In addition to many small anthracite producing companies, there are 111 operating companies producing over 50,000 tons annually.

Commercial anthracite production in 1949 approximated 40,400,000 net tons. This is a drastic reduction of 13,800,000 tons or 26 percent from the level of 1948. The principal cause of this decline was the reduced demand for heat occasioned by the warmest year in the history of the New York Weather Bureau, the records of which are generally accepted as a satisfactory guide to conditions in the consuming territory.

Considerable working time, and hence production, was lost not only because of reduced demand due to weather, but also by a series of work stoppages, strikes or holidays declared by the United Mine Workers of America. In March, the industry was idle for two weeks during the "memorial holiday." Again in June, the industry lost another week for a period of "economic stabilization." In September, work was interrupted for an additional two weeks during a so-called "welfare fund" strike period. Commencing the first week in December, under a "United Mine Workers edict," anthracite was put on a "three-day" week, and in the week following Christmas, it was further curtailed to a "two-day" week. Thus 33 days of normal working time were lost with a production loss approximating 6,800,000 tons. Anthracite production, employment, etc., for the past ten years is shown in Table I.

Bootleg Production

Any mention of commercial production in the anthracite region should include a heading under so-called "bootleg" as this is production which, although beyond the so-called commercial tonnage, is a potent factor in anthracite markets. These small mines or holes are operated non-union, do not pay any welfare funds, compensation or taxes and have always created a serious situation in the industry.

In recent years they have gradually changed from actually stealing of the coal to a lease arrangement with various land owners including lands confiscated by the counties for taxes so they can be under a legal form as to source of supply. During 1949 there were in operation around 790 of these small mines or holes with about 3000 men employed in and around same. At the present time a monthly production of about 200,000 tons of anthracite comes from this source.

For the year the estimated bootleg production was 1,200,000 tons compared to 1,800,000 tons in 1948. This reduction was caused primarily by warm weather and not by reason of a drying up of the outlaw industry. Outlaw production is now increasing as the regular collieries are on short working time.

Export Trade and Overseas Competition

Overseas exports of anthracite during the first ten months of 1949 amounted to 1,359,183 net tons. This was a reduction of 338,965 tons or 20 percent from the same period of 1948. Virtually all of this reduction was in shipments to France, the principal recipient.

As Canada shared in the warm weather experienced in 1949, it was natural that exports to that country would show a decline. Shipments during the first ten months aggregated 2,837,918 net tons, which was less than the 1948 figure by 1,371,466 tons or 33 percent. Canadian shipments also

TABLE I
Anthracite Production

Year	Commercial production, all sizes (millions of tons)	Total men employed (thousands)	Industry production per day (thousands of tons)	Weighted average days worked	Lb colliery fuel per ton of production	% pea and larger	% buck, rice, barley	% No. 4 and smaller	% from underground	% from stripping and bank	Underground production per producing employe per day	Production per total employe per day
1939....	48.3	92.6	264	183	100	...	...	...	83.9	16.1	...	...
1940....	48.2	90.8	259	186	93	64.1	32.4	3.5	81.7	18.3	...	...
1941....	52.6	87.5	259	203	86	62.9	33.2	3.9	79.8	20.2	4.69	2.65
1942....	52.6	81.6	231	245.1	83	62.4	33.0	4.6	76.3	23.7	4.51	2.55
1943....	56.8	78.6	206	275.4	83	61.2	33.4	5.4	71.7	28.3	4.37	2.42
1944....	59.9	77.0	199	300.6	74	60.8	33.7	5.5	66.6	33.4	4.41	2.45
1945....	51.4	72.2	188	273.0	79	60.4	32.6	7.0	64.6	35.4	4.38	2.37
1946....	57.3	77.4	207	277.2	66	59.9	31.5	8.6	63.8	36.2	4.40	2.44
1947....	54.0	74.6	196	270.8	65	58.8	31.0	10.2	65.67	34.33	4.32	2.39
1948....	54.6	76.0	202	270.0	65	58.9	30.7	10.4	66.0	34.0	4.27	2.38
1949*...	40.4	72.4	205	197.0	67	58.0	30.8	11.2	65.0	35.0	4.25	2.50

* Preliminary estimates.

reflected the reduced working time and production discussed earlier.

Canada received a total of 280,803 net tons of anthracite from the United Kingdom during the 12 months ending October 31, 1949. This was virtually double the quantity imported the year previous. Although no official record has been noted of 1949 receipts in this country of British anthracite it is understood in trade circles that three cargoes were consigned to Boston in December and January. With the rehabilitation of anthracite mining activities in England, her urgent need for Canadian and United States dollar balances and the devaluation of the pound, it is to be expected that she will resume the prewar practice of sending her ships to North America with pay loads of anthracite, rather than in ballast.

Railroad Car Supply

In contrast to 1948, the railroad car supply was adequate with but few exceptions, and then only on certain lines for limited periods. Car supply was eased materially by the prolonged stoppages in the bituminous coal industry and the progress of car repair and replacement programs by the carriers serving the anthracite collieries.

Following extended hearings on the petition of the railroads for increases in freight rates and charges, and the emergency interim percentage increases permitted during the hearings, the Interstate Commerce Commission finally approved a 10 percent increase in anthracite rates effective September 1, 1949, but with a limit of 35 cents per net ton.

Safety in the Anthracite Region

The fatality rate per million manhours for the anthracite region for the year 1949 was 0.78 or an improvement of 10 percent over the 0.87 for the year 1948.

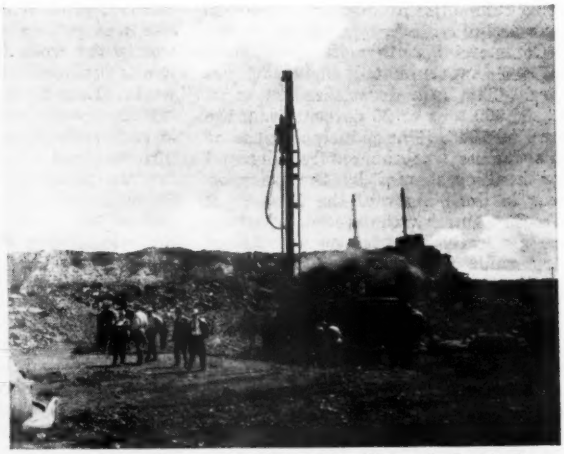
At the close of 1948 the Joseph A. Holmes Safety Association of Washington, D. C., presented the Pennsylvania Department of Mines with a "Certificate of Honor" in recognition of the low fatality rate of 0.87 achieved by the anthracite industry in 1948. It is noted in the certificate that this is the lowest fatal accident rate per million man-hours in the history of coal mining in the United States. Considering the 10 percent improvement achieved over the all-time record for 1948, no doubt the anthracite industry will again receive this special recognition for 1949.

In addition to the activities of the Pennsylvania Department of Mines inspectors during the year, a fully equipped first-aid and mine-rescue truck was maintained at Wilkes-Barre, properly manned by competent first aid and mine rescue personnel.

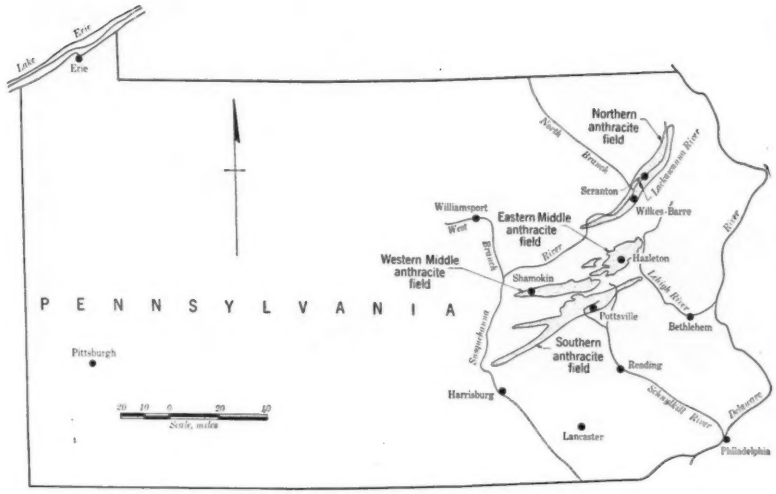
Reports from the Wilkes-Barre Branch, Safety and Coal Mine Inspection Division, U. S. Bureau of Mines, reports that during the year the personnel of 25 coal mine inspectors completed 668 mine inspections, trained 321 mine safety committeemen and 2,175 anthracite workers in the accident prevention course for miners and mine workmen. The Bureau of Mines also maintained, for emergency use in the anthracite region, a fully equipped mine-rescue truck.

Unusual interest was manifested in first-aid training and contests in the anthracite region. In addition to the training by company-trained instruc-

Dragline at Jeddo-Highland Coal Co. handles 22-cu ft bucket



Percussion drilling a blast hole at the Shenandoah stripping



Work stoppages and mild weather reduced output from the anthracite field

tors, the State Department of Mines reports the training of 2339 in first aid and 230 in mine rescue during the three-year period of 1947, 1948 and 1949; of this number 754 were trained in first aid and 105 in mine rescue. The U. S. Bureau of Mines, anthracite division, reports training of 1048 in first aid and 164 in mine rescue.

Many company and division elimination first-aid contests were held during the summer months, culminating in an anthracite regional first-aid contest on September 10, 1949, in the Kingston Armory, Kingston, Pa. Twenty-one teams participated with a differential in the final score of but 2.33 percent between the first and last place team. The winner scored 99.666 percent and the last place team 97.333 percent.

State Legislation on Anthracite

Of importance to anthracite producers in the 1949 session of the State Legislature was the enactment of Act No. 246. This Act amends the notorious Act 481 of 1947, sometimes called the "Tax Everything Law." The new Act prohibits the levying of taxes on the mining or handling of natural resources. There still remains, however, the power of municipalities to levy a real estate tax on minerals, but the new Act removes the constant threat of local taxation on mining, conveying, storing, etc., of coal.

Other state legislation of importance, having effect on the anthracite industry, includes—

Acts 409 and 410—Increasing benefits and costs under the Workmen's Compensation and Occupational Disease law about 25 percent

Acts 179, 404 and 551—Changing the payments and increasing maximum unemployment benefits incident to the operation of the Employes Compensation Act

Act 438—Increasing the amount of bond for the privilege of engaging in strip mining

Act 439—Authorizing municipalities to acquire pillars for surface support

Act 437—Strengthening the Act defining substandard anthracite and requiring producers and dealers engaged in the sale of anthracite to make certain statements and to keep certain records

Act 160—Strengthens the power of weighmasters and inspectors of weights and measures in the handling of solid fuel.

Anthracite Institute and Research

Full-time research work was continued throughout the year by the research end of the Anthracite Institute, by the Pennsylvania State College and by the U. S. Bureau of Mines. As to practical work being done, several manufacturers by the help of the Institute have introduced three new models of Anthra-Flow—two for boilers and one for warm-air furnaces. The Institute developed a new type pneumatic ash removal system for residences, in conjunction with the bituminous coal and coke industries. Further research work was conducted on tobacco curing by the use of anthracite. Favorable field results are being reported. Joint research into the utilization and preparation of fine sizes is continued by the Commonwealth of Pennsylvania at Penn State College and the Anthracite Institute.

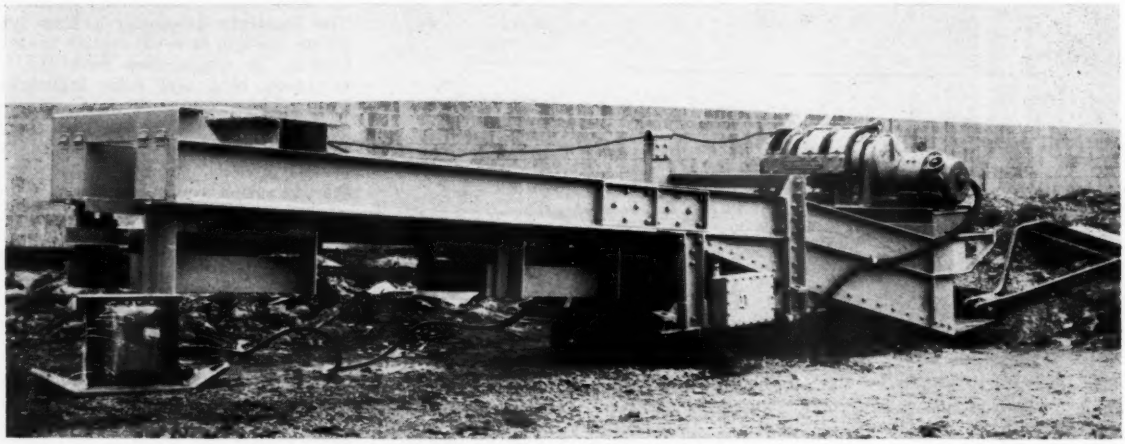
The U. S. Bureau of Mines under the "Anthracite Flood Prevention Project" is currently employing a large quota of engineers to investigate all phases of the mine water problem in the anthracite region, namely, as to the amount of water handled by pumping from the mines; investigating and locating the size of existing barrier pillars and plans and programs for the removal of existing underground water pools and drainage of active mines. They are also completing a study of the "Buried Valley of the Susquehanna River" in the Wyoming field in order to delineate the confines and extent of the valley to aid mining companies to protect their properties.

Construction work was started and about half completed during the year for the new $500,000 anthracite research experiment station of the U. S Bureau of Mines, located at Schuylkill Haven, Pa. It is expected that this building will be completed during 1950 and research work will be started then on all phases of utilization as well as production problems of the anthracite industry. The work will be carried on by the U. S. Bureau of Mines in conjunction with an advisory committee comprising operators and union officials.

New Plants and Equipment

There were no large cleaning plants or breakers installed in the industry during the year 1949. The flotation plant at Glen Burn Colliery, Susquehanna Collieries Division, The M. A. Hanna Co., went into full operation

Anthracite research laboratory of U. S. Bureau of Mines at Schuylkill Haven, N. Y.



U. S. Bureau of Mines shaker-scraper loader

and Philadelphia & Reading Coal & Iron Co. started construction on a froth-flotation plant at their Locust Summit Breaker.

Some smaller installations of equipment at the various going breakers were put to use but none of large magnitude.

Oil spraying of anthracite coal increased as large companies in competitive situations obtained satisfactory results. The results are still being studied for market-wise acceptance of this sprayed coal. The Glen Alden Coal Co. completed and is now operating a wood treatment plant for mine ties and timber.

There was virtually no change in underground mechanical mining or stripping equipment during the year.

State Sanitary Water Board

One of the highly important factors during the year was the work by the industry as a whole in cooperation with the State Sanitary Water Board designed to remove various silt elements in the breaker water discharges into the streams of the Commonwealth. This was an outstanding accomplishment of the anthracite industry brought about under orders from the Sanitary Water Board of Pennsylvania. The effective removal of silt from colliery waste waters results in the discharge of virtually silt-free waters, in many instances resembling spring water in appearance, in contrast to the coal-black waters formerly issuing from silt banks. The means used ranged from simple settling basins, single or multiple, and often formed in stripping pits, through mechanical cleaning devices such as clarifiers and hydro-separators, to elaborate froth flotation plants in which solids down to minus 200 mesh are recovered. Three such latter plants are now in operation and three more are under construction or scheduled for construction. The desilting is accomplished through effective quiescent sedimentation, in contrast with the rapidly flowing streams of breaker water which used to meander over the top of the silt banks, and the solids are deposited instead of going out in the waste waters.

Careful location of inlets and outlets, a quiet pool of adequate size and depth, suitable weir lengths, proper freeboard, and stable basinwalls—all simple and practicel measures—suffice for the basins. Proper upward velocities, generally not exceeding 3 ft per hour, give good results in the mechanical cleaning devices.

Anthracite stripping at depth

The amount of solids deposited from the breaker waste waters has amazed many of the operators and has necessitated adequate sized basins or, as is frequently done, the cleaning of alternate basins, often for sale of the solids. Many collieries have found it advantageous to dispose of waste solids by back flushing to old mine workings, or in abandoned stripping pits. In some cases clogging of entries may occur unless the larger solids are first settled out. Underflow from clarifiers must be settled, usually in settling basins constructed for the purpose or in abandoned stripping pits.

Although the Sanitary Water Board's greatest emphasis was first concentrated in the Schuylkill basin in order to meet a dead line set for dredging the silt which had accumulated in that river over the past 50 or more years, the work was carried on simultaneously in the other three fields. Today all 43 of the operating breakers in the Schuylkill basin have desilting works in operation and the silt burden carried by the upper river, including that due to erosion from culm banks, now ranges from about 2 percent to 15 percent of the former load, depending upon river stages. Below Kernsville Dam at the edge of the Schuylkill coal basin the silt burden had been reduced from a load of 349,000 tons a month in November 1947 to 415 tons a month in September 1949. The completion of desilting devices in all of the collieries in the other fields is being pushed.

As of October 15, 1949 desilting works at 145 collieries had been completed, 18 more were under construction and only 11 had not been started for all of the 174 active breakers in all four coal fields. In the near future it is expected that the issuance of black waste waters from the anthracite collieries will be history and that a large part of the formerly wasted Btu's will be put to use. The natural corollary is that the days of the river washeries are numbered.

According to the best estimates 18,750 tons a day of silt were discharged to the streams on January 1, 1946 but only 3600 tons a day as of October 15, 1949—a reduction of 15,150 tons a day or 81 percent.

Ore breaking at Sierra Magnesite, Gabbs, Nev.

Nonmetallics

Recent Trends Indicate Continued High Production

By RAYMOND B. LADOO
Consulting Engineer
Newton, Mass.

PROGRESS in the industrial mineral industries continued unabated on almost all fronts in 1949. Technological advances, beginning at rather a slow pace at the close of World War I, gradually accelerated for a decade up to the crash of 1929. In the depression decade of 1929-1939 progress continued, but at a pace retarded by lack of incentive and capital to implement new ideas. But in the last decade, including World War II and the booming postwar years, the nonmetallics have really come into their own.

By any standards increased production, quality improvement, new products, new plants, new methods, new machines and equipment, increased public recognition—the industrial mineral industries have made phenomenal progress in the past few years. Not many years ago even well informed people used to query "Just what are these nonmetallic *metal* (sic) industries?" But today people are beginning to note with surprise that these industries in many states are more important in dollar volume and in number of men employed than the metal mining industries.

Progress is a gradual process—not a detached incident to be pinned down exactly within a calendar year. Even successful inventions require years for development before their value is fully realized. So it is difficult to recount specific advances made within the year 1949. It is better, perhaps, to try to judge trends—to consider where we stand today and what we may expect in the future.

Output Maintained

Since official production statistics for 1947 are not even yet completely available, for 1948 only for a few minerals, and for 1949 not yet compiled, we can speak of recent production progress only in general terms.

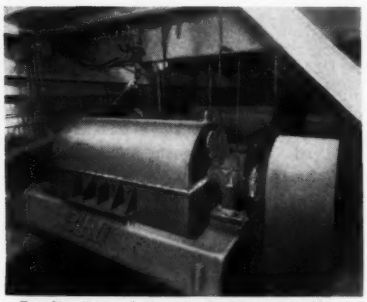
Many minerals made new all-time production records during the war, followed by moderate declines in the immediate postwar years. However, in most cases, production did not drop back to that of prewar years. From about 1947 production began increasing again and in 1948 some minerals made either new all-time or peacetime records. For example, in 1948, the production of talc, prophyllite and ground soapstone, of 518,746 short tons, made a new all-time record, both in total quantity and in value. Domestic fluorspar shipments in 1948 made a peacetime record, imports made an all-time high, and total domestic consumption was only 1 percent under the all-time record of 1944. In 1948 fluorspar shipments were 331,749 short tons; imports 111,626 tons; and consumption was 406,269 tons. The 1948 production of portland and other hydraulic cements reached the record high of 205,448,263 barrels.

Other mineral industries which made new production records in 1948 included gypsum (7,044,447 tons) or a million tons over the previous record year of 1947); natural sodium sulphates (265,862 tons); calcium chloride from natural brines (301,936 tons); refractory magnesia (330,069 tons); pumice and pumicite (607,746 tons); phosphate rock (9,388,160 tons mined production); potash salts (2,138,493 tons); kaolin or china clay (1,568,848 tons); salt (16,403,293 tons); bentonite (920,566 tons); as-

bestos (37,237 tons mined and 647,881 tons imported, both were records).

These records reflected the pent-up peacetime demands of the construction, highway, chemical and other industries as well as the prosperity of agriculture and labor.

Lack of 1949 production statistics and rapid changes in conditions make 1949 production estimates hazardous. Early in the year general business hesitancy, particularly in the construction industries, and the partial satisfaction of accumulated demands caused moderate recession in some of the mineral industries. For example in the first quarter of 1949 the production of crude gypsum and of most



Application of the continuous centrifuge has effected vast improvement in the preparation of paper filler and coating clay

gypsum products was somewhat smaller than that of the first quarter of 1948. Talc production similarly showed declines in the early part of the year. On the other hand portland cement production showed consistent gains each month for the first half year, over corresponding months of 1948. Later in the year, as business began to regain its courage and the pace of construction increased, mineral production again began to increase. But the steel and coal strikes again retarded demand for some commodities. These strikes and the extensive devaluation of foreign currencies again caused business hesitancy. The net results on the total nonmetallic mineral production for the year are difficult to evaluate but probably, on the whole, the final figures will show moderate recessions from the 1948 peaks.

The outlook for 1950 production is generally good unless there are new discouragements to undermine business confidence. Those industries which directly or indirectly sell to or are dependent upon the chemical industries which have important export markets may experience decreasing demands. This would be due in part to dollar shortages abroad and in part to increasing foreign production and foreign competition. Another factor is the continued lowering of import tariff barriers by international agreements. This not only affects domestic production directly, such as increased imports of fluorspar, but also indirectly, due to increased importations of finished products replacing products in which domestic minerals are used.

At the end of the year a strike closed the New Mexico potash plants. Since this is the season of greatest fertilizer production it was predicted that 1950 would see the most serious potash shortage since World War I, when foreign potash was cut off in 1915.

New Products and Markets

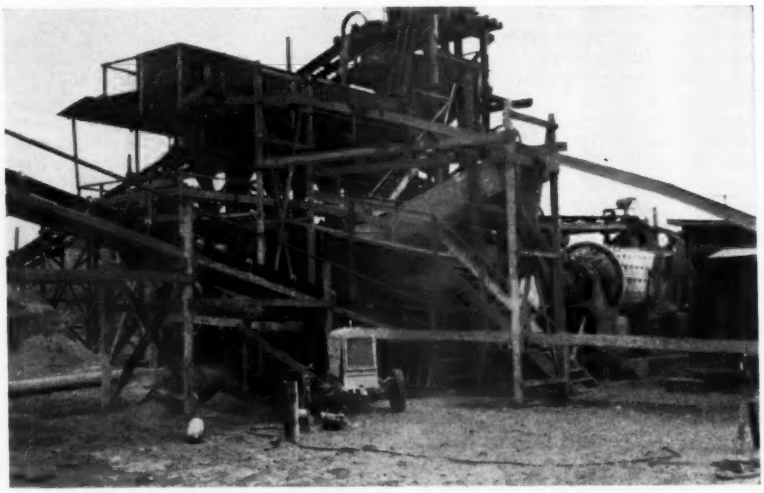
One of the outstanding features of the nonmetallic mineral industries is the frequency with which new mineral products appear, some gradually replacing older products and some finding almost wholly new markets. An excellent example is bentonite. In 1920 bentonite production was only 2790 tons; in 1930 it had risen to 82,593 tons; in 1940 to 251,032 tons; and in 1948 to 920,566 tons. In less than 30 years this mineral, which was largely a curiosity in 1920, has become of major importance. In about this same period many new minerals have risen from mineralogical obscurity to important poistions in our mineral economy. Among these should be noted nepheline syenite, aplite, perlite, pinite, topaz, andalusite, dumortierite, kyanite, olivine, forsterite, serpentine, ilmenite and rutile, the lithium minerals, langbeinite, kernite, brucite and several others.

In addition to new mineral industries we have wholly new uses for established minerals, such as activated bauxite as an adsorption medium. These new uses may radically change the end use pattern and geographical distribution of markets. A good example of this trend is barite. Twenty-five years ago over 50 percent of the barite consumption was for making lithopone, total consumption was 200,000-300,000 tons per year, and its use for oil well drilling mud had not started. Today the total consumption is around 850,000 tons of which 65-70 percent is for oil well drilling mud.

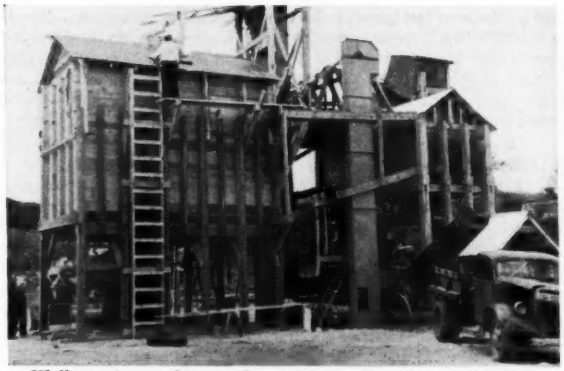
In 1925 feldspar consumption in glass was of minor importance and total consumption was around 200,000 tons per year. Today annual consumption is around 450,000-500,000 tons and 50-55 percent is used in the glass industry. In other words most of the great increase in production was consumed for an almost entirely new use. This record is even more astonishing when competitive materials are considered. In 1925 feldspar had almost no competition for its major uses. In 1934 nepheline syenite became a competitor and today well over 50,000 tons per year compete with feldspar for ceramic markets. Aplite became an active competitor for the glass trade in 1938. Large amounts of pyrophyllite and talc replaces feldspar, wholly or in part, in certain ceramic bodies. And there are several other competitive materials partially established or in the offing, such as pumicite, slag, Garspar (a by-product of glass grinding), and others.

Commercial production of perlite began about 1946 with a recorded production of 4206 tons. In 1947 production had reached nearly 11,000 tons and progress continued at a rapid rate through 1948 and 1949. In 1947 a Perlite Standards Association was formed, later developing into the active and vigorous Perlite Institute. This new mineral industry promises to become of outstanding importance.

Wollastonite is another new mineral which is appearing over the horizon. Although some production was recorded in California as early as 1933 and on a minor scale from a deposit near Willsboro, Essex County, N. Y., since about 1943, general knowledge of this mineral started in 1949 with



Hydraulic sand sorting plant at Becker County Sand & Gravel Co., Detroit Lakes, Minn.



Wollastonite crushing and screening unit under construction by Willsboro Mining Corp.

Quarry face of wollastonite; Willsboro Mining Corp. Reserves are in the order of 15,000,000 tons

the publication of a report [1] summarizing research work done on this interesting mineral. A pilot plant demonstrated the possibilities and a production plant was under construction in the fall of 1949, by Northern Minerals, Inc., of Essex, N. Y. Wollastonite will be produced, with a valuable abrasive garnet by-product, by both wet and dry milling, in a range of products to be used as fillers in paper, paint, rubber and other products, in ceramics (wall tile, bodies, abrasive wheel bond), welding rod coatings, as an adsorbent, as a lining material in agriculture (partly replacing phosphate), and other uses. It is reported that, by chemical means, a filler may be made from it with a particle size of the order of 20 to 30 millimicrons.

New Sources of Minerals

Changes in geographical distribution of consuming industries, new uses, increased demand, and gradual depletion of older deposits have led to the search for new sources of established minerals and to the working of deposits previously considered of no commercial value. At the same time improvements in technology — new methods, machines, and equipment— have made both possible and economical the development of new sources of mineral products. Examples are numerous. The barite deposits near Malvern, Ark., where extremely fine grained barite is intimately mixed with fine grained silica and shale particles, were of no commercial value until froth flotation methods were developed, about 1941, for the separation of this fine grained barite. Previously a non-producer of barite, by 1944 Arkansas had become the largest producing state, and by 1947, was producing nearly 30 percent more than the former chief producer, Missouri.

Although the extraction of magnesia from sea water is not new, the exploitation of this source on a large scale has been established only in recent years. Magnesia from sea water has changed our thinking as to evaluation of deposits of natural magnesite. Sea water is also now one of our chief sources of bromine. Due to the use of ethylene dibromide in antiknock gasoline, bromine has risen to a highly important position in our economy (over 100,000,000 lb, valued at nearly $20,000,000 in the peak year of 1944).

Due to rising demand and increasing difficulty of locating new sulphur-bearing domes in the Gulf Coast region other sources of sulphur are of growing interest. During 1949 the building of several new plants was announced, to recover sulphur from natural gas and crude petroleum, petroleum refinery gases, and other industrial waste gases.

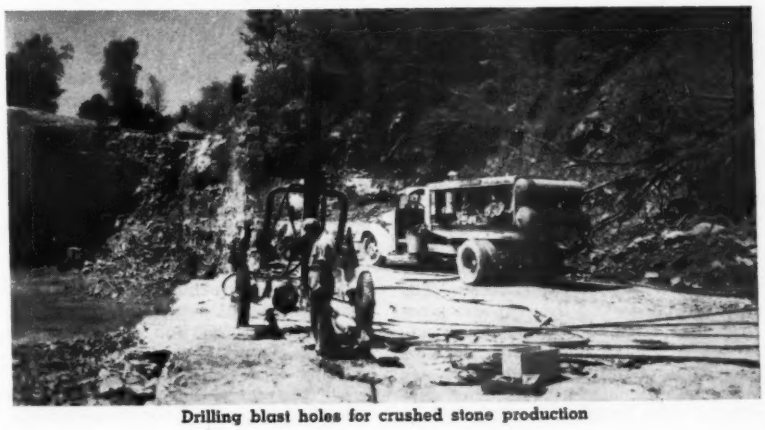
The great increase in the importance of titanium, both for pigments and for metallic titanium, has led to world-wide search for new sources of ilmenite and rutile. The need for more titanium plus increased demands for iron ore has led to the large scale development of such titaniferous magnetites as those of the Sanford Lake area of New York. The low grade beach sands of Florida are being treated on an extensive scale in Humphreys spirals to recover ilmenite, rutile, and zircon.

The depletion of large and accessible deposits of high grade feldspars, increased demand, and the development of froth flotation methods for the separation of quartz and feldspar have led to the working of low grade feldspar deposits. Several new flotation plants have been built in the past few years and progress has been made toward the recovery of feldspar from feldspathic sands, granite and other feldspathic rocks.

Processes and Equipment

New processes and equipment may be either causes or results of increased demand, lower grades of ore, and increasingly high standards in mineral specifications. Equipment may be developed to meet more exacting specifications or new machines and methods may make better and cheaper products and so expand markets. But, as noted before, changes are gradual and revolutionary improvement can rarely be pinned down to an exact date or year. The most outstanding improvements in nonmetallic mineral processing in recent years are noted below:—

(1) Bird continuous centrifuge for fine wet sizing has revolutionized the preparation of paper filler and coating clays. In closed circuit with wet pebble mills the centrifuge has set new standards for



Drilling blast holes for crushed stone production

[1] Amberg, C. R., and McMahon, J. F., Wollastonite, An Industrial Mineral. Bulletin No. 4, N. Y. State College of Ceramics, Alfred, N. Y. (July, 1949), 60 p.

extreme fine grinding of mineral fillers.

(2) Improved centrifugal air separation has made possible increasingly fine grain size by dry grinding.

(3) Fluid energy or micronizer type of dry grinding mills, now made by several companies, are becoming of growing importance for fine grinding nonmetallic minerals.

(4) Froth flotation is now a vital part of the flow-sheets of an increasing number and variety of nonmetallic mineral mills. Examples; — fluorspar, feldspar, phosphate rock.

(5) Heavy-Media or sink and float concentration.

(6) Table agglomeration.

(7) Humphreys spirals.

(8) Improved high intensity magnetic separation.

(9) Improved pneumatic concentration tables (Sutton-Steele and Steele).

For such common and low priced materials as sand and gravel, specifications are becoming increasingly exacting and difficult to maintain by older production methods. On large concrete structures sand specifications now often require exact, predetermined ratios of various grain sizes. To meet these specifications it is usually necessary to separate the sand into size fractions (up to 8 or 10) and recombine them in the proper proportions. For this purpose the Deister Concentrator Co. has recently developed a new hydraulic classifier, called the Concenco SuperSorter, which divides the feed continuously into any number of equal or unequal fractions based on grain size.

Mineral Substitutes

The substitution of one mineral for another or of a synthetic product for a natural product may have much or little effect on a mineral industry, depending upon the extent of the substitution and whether or not new markets can be developed for the older product.

The substitution of artificial abrasives for natural abrasives, the use of concrete and steel in place of building stone, and the use of prepared roofing in place of slate caused great declines in the older industries. But, as already noted, feldspar production has continued to increase in spite of the introduction of substitute materials.

In evaluating any mineral industry this factor must be considered. The essential needs and the wartime scarcity of sheet mica of capacitor grade caused extensive redesigning of electrical equipment to eliminate or reduce the amount of mica needed. Mica substitutes were found to serve many of the less critical needs. In Germany, during the war, synthetic mica was made and used successfully in essential equipment although at high cost. The need for natural sheet mica has not yet been eliminated but it may be eventually.

Similarly we are learning how to grow quartz crystals artificially. It has been done successfully from a technical standpoint, but the process is as yet too slow and costly to compete with natural quartz of piezoelectric quality.

Due to world-wide shortages of high grade asbestos in recent years and the failure to discover important new deposits the search for substitute fibres has been greatly stimulated. Glass fibres, while they may be drawn exceedingly fine, are more brittle than asbestos and do not possess the quality of almost infinite subdivision into still finer fibres possessed by asbestos. However, mixtures of asbestos and glass fibres, for some uses, seem equal to or better than pure asbestos. The ideal substitute for asbestos has not been found, but it is a possibility which deserves consideration.

Adverse Economics Affects Industry

The day has just about gone when a small company or individual operator of limited means can start from scratch and build up a business out of earnings. The reasons for this are both financial and technical. Due to inefficiency, union rules and high labor costs, all plants today must be as highly mechanized as possible. Lower grade ores and stiffer specifications make necessary more elaborate processing plants. Machinery and equipment are expensive. Elaborate flow sheets require large plant floor space and building construction alone today usually costs much more than did entire plants a decade ago. Plant control and research laboratories are now necessities and they must be manned by skilled technicians. Health and labor laws require extensive dust collection systems, waste gas and fume control, and provisions to guard against stream pollution. Wet process plants need plenty of water, and industrial water is becoming scarce in many areas.

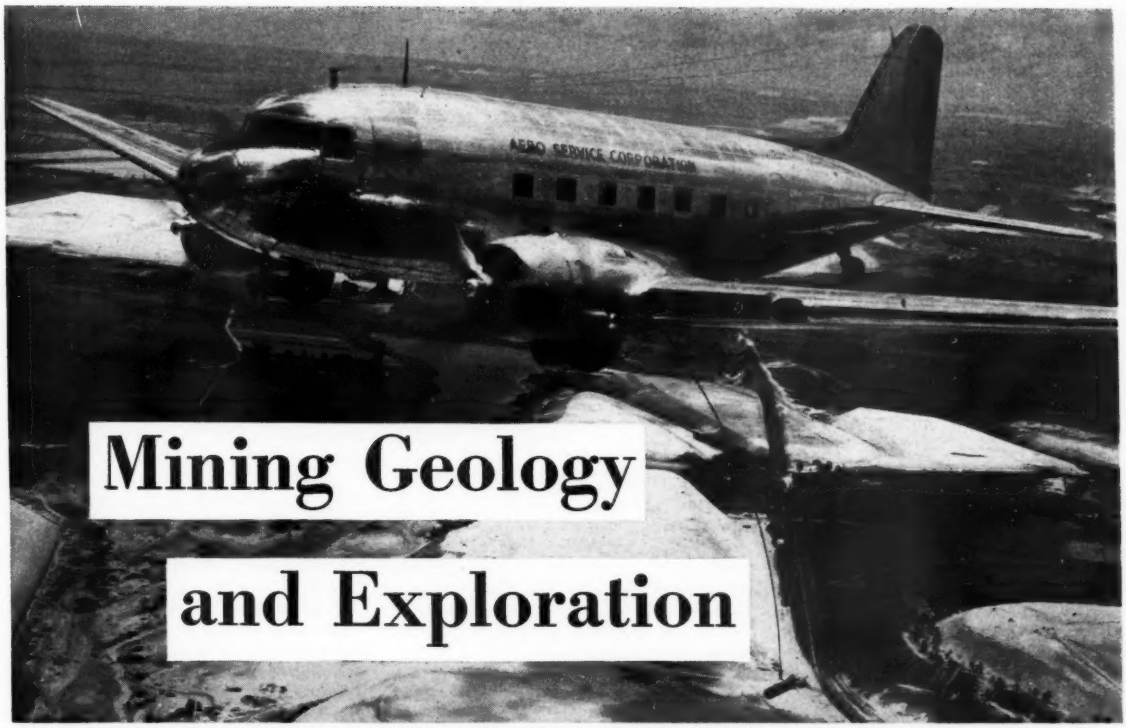
Risk capital, for any purpose, is becoming exceedingly difficult to find in sufficient volume to start new enterprises of even modest proportions. Antitrust monopoly prosecutions are making the very large companies chary of increasing the size or diversity of their operations. High taxes, the government's increasing hostility toward depletion allowances, and union rules and demands, all combine to make unattractive the starting of new mining enterprises.

All this means that the owner of an unworked deposit today usually finds it is most difficult either to develop the deposit himself or to find anyone else to undertake it. The best place to seek support for the development of a new deposit today seems to be among the established companies which are large enough to have adequate capital but not so large as to be in anything like a monopolistic position.

Another factor in mineral economics which may have an important long term effect is that of elimination of the basing point system of pricing in the portland cement industry. If this decision stands and is extended generally to other commodities it will have an important effect on mineral developments. A case in point is that of the Westvaco Chemical Co., Division of Food Machinery Corp. at its new trona operation at Westvaco, Wyo. Unless they can compete on a delivered price basis in their logical markets, much of the attractiveness of that operation will disappear. Elimination of basing point pricing will tend to discourage or make uneconomic some present operations, but it may also encourage the starting of new operations at more favorably located points.

To just what extent present government policies are responsible for high mineral production it is hard to say. Government subsidies of agriculture at high prosperity levels and its own fertilizer distribution activities assure strong demand for the agricultural minerals, potash, phosphates, nitrates and agricultural limestone. Government building of dams for reclamation, power and navigation, Federal and state road building, and other public works create large markets for portland cement, sand and gravel, and crushed stone. The Federal housing program will use large quantities of lime, gypsum and other building products. Government deterrents to the starting of new enterprises will not greatly hinder production from established plants. On the other hand our foreign policies tend to reduce exports (fertilizer materials for example) and to encourage imports of such minerals as fluorspar.

Although industrial mineral production is now at a high level and will probably continue at nearly the same rate for the near future, producers must be continuously and increasingly alert to changing conditions which may vitally affect their business, both from competitive and governmental activities. Either threats to their prosperity or opportunities for progress may result from rapidly changing technical, legal, financial, labor and other developments. Business today is so interrelated and complex that events far removed from the immediate problems of one industry may have vital effects on its prosperity.



Mining Geology and Exploration

Results obtained with the airborne magnetometer and precise mapping cameras have aided extension of South Africa's gold mining activities

World-Wide Activity Aimed at Extending Reserves

By RODGERS PEALE
Consulting Mining Geologist
San Francisco

EVOLUTION of the theory of the formation or ore deposits is a slow-moving process. The broad, general principals were enunciated by the masters of 25-50 years ago and in the intervening period. Some of those theories have been discarded but few if any new fundamental ideas have been advanced. Thus it is not easy to describe the changes in geologic thinking which take place in the short span of one year.

A significant and highly healthy trend of a few geologists to begin to doubt some of the time-honored concepts is beginning to show. Question is being raised as to the validity of Lindgren's classification of metalliferous ore deposits because of the rarity of cases where epithermal ore grades into mesothermal and mesothermal into hypothermal. It has been advanced that epithermal deposits are formed in the zone where meteoric waters prevail and therefore they should not be treated in the same genetic sequence with mesothermal and hypothermal ores.

Further thinking is being done on the location of ore deposits in the continental structure somewhat along the lines of Billingsley and Locke. Such studies may indicate where new districts might be found.

Still other geologists are working on the composition and concentration of the hypogene ore-forming fluids.

Laboratory Experimental Work

Kennedy, Bowen, Tuttle, Friedman and others, through their experiments, are building knowledge of silica-water systems, with or without alkalis. Within the temperature range at which ore deposits probably formed, they show that silica is far more soluble in ionic solutions than formerly believed.

F. Gordon Smith [1] at Toronto University is working with the synthetic crystallization of gangue minerals, thereby studying their temperature and solubility ranges. He is also studying the temperature of formation of crystals taken from ore bodies by heating them to the point at which they decrepitate. Smith has shown that gold and tin are soluble in certain alkaline solutions, as in the case of some other base metals. Much more of this type of work is needed.

Wall Rock Alteration

During past years, great emphasis has been placed on structural controls of ore bodies, and much is still being written on this subject. But during 1949 some attention has been given to wall rock alteration. Two most important contributions to the study have been published. Sales and Meyer have continued their work at Butte and have published a second paper, the first appeared in 1948,[2] carrying on their story of vein formation. The paper is convincing that, at Butte at least, vein formation as well as wall rock alteration progressed as a continuous process. In the wall rock, sericitization is forcing argillization farther away from the vein, as one army driving another before it. Likewise as sulphur concentration increased in the solutions, the chalcocite-bornite zone forced the chalcopyrite-bornite zone gradually upward. Thus the relation is opposite to what

[1] F. G. Smith and P. A. Peach, Recent Advances in Laboratory Study of Ore, Canadian Mining and Metallurgical Bulletin, July, 1949.
[2] Sales, R. H., and Meyer, Charles, T. P. 2400 Mining Technology, AIME, 1948.

one would expect if the chalcocite were secondary.

The second paper of importance embodies the work of Lovering at Tintic.[3] As opposed to Sales and Meyer, he postulates that the rock alteration at Tintic is the result of spurts of solution of differing chemical composition.

At the 75th anniversary celebration of the Colorado School of Mines two half days were devoted to rock alteration as applied to mining geology. As yet these papers have not been published but indicate the renewed interest in the subject.

Geologic Tools

During 1949 there was a continuation of the trend of mining geologists to study detail. Large scale mine maps and even photographs are coming into more common use. Mapping of details of structure and rock alteration, which were seldom noted in the past, is now commonplace.

Geophysics, especially in the form of the airborne magnetometer, has been in extensive use both in Canada and in the United States. In Minnesota 32,000 sq miles of the iron country have been covered by a combined project of the U. S. Geological Survey and the Minnesota Geological Survey. In Maine [4] the airborne magnetometer was used to map the mafic rocks in which asbestos occurs. In Eastern Canada the Dominion Gulf Co. has flown 50,000 sq miles. Anomalies indicated are then followed by ground geophysical work, geologic mapping and drilling. Although the possibilities and limitations of the airborne magnetometer are not yet known, it promises to be a rapid reconnaisance tool for the exploration of certain deposits.

Also, the ground magnetometer, gravimeter and electrical methods are being used increasingly and as familiarity and experience with these new tools grows, so will the success in finding new mineral deposits with them.

In Nevada, Philip A. Laylander is experimenting with large scale color aerial photography in studying mineralized zones.

[3] Lovering, T. S., Rock Alteration as a Guide to Ore, Monograph 1, *Journal of Economic Geology*.

[4] Patrick M. Hurley, Airborne Magnetometer Survey in Maine, E. & M. J., August, 1949.

Calumet & Hecla drilled in Tonopah district and encountered gold- and silver-bearing quartz veins

The U. S. Geological Survey, under the direction of H. E. Hawkes, Jr., is experimenting with the possibilities of geochemical methods of prospecting. Work has been done at Tintic, Utah, and Willcox, Ariz., as well as at eight other mining districts in Montana, Idaho, Arizona, New Mexico and Tennessee. To date, results indicate that buried ores may be found by chemical analysis of residual soil and alluvium. Although less definite, some results may come also from analysis of vegetation and surface waters. There are indications that there are dispersion halos of traces of metals in the rock overlying blind ore bodies. These traces are large enough to be detected. Thus this new field, while still in its infancy, definitely shows promise. The work of the Geological Survey has been supplemented by independent work by two or three mining companies, among which is the St. Joseph Lead Co. Paul Kerr and D. L. Graf are also doing work in this field.

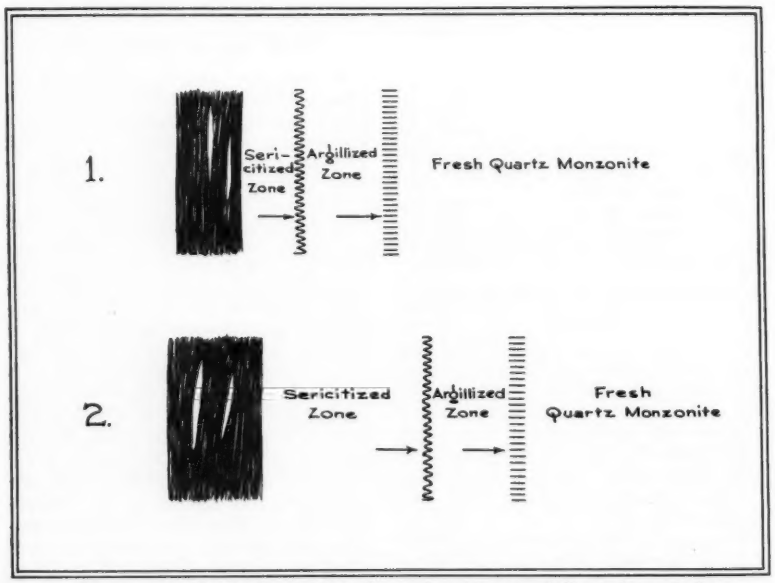


Fig. 2 represents idealized currently observed positions and dimensions of alteration zones adjacent to a mineralizd fissure at Butte. Fig. 1 represents the interpreted alteration pattern at the same place at an earlier time in the process of mineralization. The arrows indicate direction of contemporaneous migration of alteration zones, according to the interpretation of Sales and Myer

Education and the Geologist

In his address on retiring as president of the Society of Economic Geologists in February, T. M. Broderick outlined how the profession of mining geology is affected by the attitudes of mining companies, by competition from educational and governmental institutions, and by the geologist himself.

In recent years ore deposits have become harder and harder to find; exploration programs are costing greater sums of money and as a result the responsibilities of the geologist are increasing at a rapid pace. The outcropping deposits which have not become mines have been examined time and again with negative results. To recommend an expenditure for exploration the geologist must be able to see farther into the ground than his predecessors, if the deposit outcrops, or he must have worked up a reason for the existence of a blind deposit or district.

The result of these conditions is that a geologist now must know more than those of the past. The science must advance in order for the geologist to keep finding deposits in a region already well worked over. This environment stimulates advances in theory.

What sort of an education should a geologist have to meet these more stringent requirements? Mining geology is an engineering science and those who would follow this profession should have the equivalent of the first two years in engineering to give him the necessary fundamentals. The following years, be they two or four, should be devoted to the development of the student's knowledge in mining and structural geology (especially as applied to ore bodies), geophysics, geochemistry, mineralogy and other important subjects. To perform some of the complicated laboratory experiments now being undertaken, one should be a trained chemist; but a trained chemist would not have the geologic training.

Large companies have the work and the resources to afford a chemist to work with the geological department, but many geologists do not work with large companies or do not teach at universities where they may consult with chemists. Geologists have realized this trouble for some years. The Geological Society of America held a series of conferences on this subject in 1946 and 1947 and in 1949, J. D. Forrester[5] added another constructive paper.

Exploration Programs

Probably never before, unless it was in 1948, has the search for new ore bodies been as intense as during the past year. The large mining companies and government agencies are conducting extensive campaigns of exploration. The companies are concentrating on broad prospecting, geological and geophysical work in new fields or in other cases are giving intense study to many of the old dead districts of years ago. The government agencies are restudying old mining districts as well as new areas of promise. They are exploring also the extent of known marginal or low grade mineral deposits for future use in case of national emergency.

In 1949 the U. S. Geological Survey worked in 53 mining districts in 32 states. The larger field projects included: vanadium and uranium in Colorado; phosphate in Florida, Idaho and Montana; lead and zinc in Idaho, New Mexico, New York, Utah and Wisconsin; iron in Michigan and New York; copper in Michigan; chrome in Montana; talc in New York; monazite and feldspar in North Carolina; and pegmatite minerals in South Dakota.

[5] J. D. Forrester, Mining Geology and the Engineering Aspects of Mineral Exploration, Econ. Geol., September, 1949.

The U. S. Bureau of Mines, partly in conjunction with the Federal Geological Survey, investigated 44 mineral deposits or areas in 27 states and Alaska by drilling, trenching, sampling, underground development, experimental mining, metallurgical testing, etc. The object of much of this work was to establish the amount of low grade ore in existence as reserves for the future or for emergencies. Summaries of ore reserve data or mineral atlases on several mining districts were in the process of compilation.

Copper

A drilling campaign being conducted by Gaspé Copper Mines, Ltd., on the Gaspé Peninsula, Quebec, has indicated 40,000,000 tons (E. & M. J., June 1949) of low grade copper ore. Work is continuing. Gaspé Copper is a subsidiary of Noranda Mines, Ltd.

Surface plant of the Copper Range Co. at White Pine where some 8000 ft of development work checked diamond drilling

The development of the White Pine copper deposit by the Copper Range Co. has continued and another 20,000,000 to 30,000,000 tons of ore has been indicated by scout drilling. The total indicated tonnage now stands at approximately 220,000,000 tons of ore with a grade of 1 to 1.25 percent copper. Metallurgical tests by pilot plant have indicated a much better recovery is attained by coarser grinding than was at first thought necessary. Next to San Manuel, White Pine is probably the greatest nonferrous mineral discovery on the North American continent in several years.

In the Cobar-Nymagee district (New South Wales, Australia) an intense reexamination of this old district is going on. The program includes geological, geophysical and geochemical crews supplemented by diamond drilling. This program is an example of intense restudy of an old district.

A new deposit has been found by drilling near Miami, Ariz. It is said to be similar to Castle Dome.

In Peru the American Smelting & Refining Co. is drilling or preparing to drill two porphyry copper deposits. Although these properties are not new, no figures have yet been published as to tonnage and grade.

Mount Morgan, Ltd., Queensland, Australia, is conducting a drilling campaign on a prospecting area of 22½ sq miles. Mount Isa, Ltd., with the Zinc Corp. is investigating a prospecting area of 75 sq miles.

Macassa Mines has instituted a program of geologic mapping, trenching and drilling on Cape Mamainse on the east shore of Lake Superior where the geology is said to be similar to the Michigan copper district. Several chalcocite and native copper occurrences are said to have been uncovered.

Gold

The Calumet & Hecla Consolidated Copper Co. has concluded its work at Tonopah, Nev. The annual report states the company "encountered quartz veins carrying gold and silver in favorable geological conditions similar to those in the old camp near by. These results justify further exploration to determine whether or not they are of commercial importance." It is hoped that this program to revive the old Tonopah district will meet with success. It is said that eight holes were drilled to depths of 1500-2000 ft.

At Goldfield, Nev., the Newmont Mining Corp. continues to expand its operation but is publishing no information. This operation is also an attempt to reopen one of the old mining districts after renewed study.

In Canada new gold deposits and extensions of known ore bodies are too numerous to describe in detail in such a short article. Suffice it to say that there were no startling new strikes this year. Although the Howe Sound Exploration Co., Ltd., has been developing its Snow Lake mine for several years it is probably the largest new gold producer for 1949. It came into production in June.

H. J. C. Connolly is largely responsible for a drilling campaign to locate the repetition of the Great Fingall lode in Western Australia. Drilling will extend below depths of 2500 ft.

American Smelting & Refining Co. is participating in this new venture.

The continued extension by drilling of the Orange Free State goldfields in Africa is undoubtedly the outstanding development in gold during 1949, as it was in the two preceding years. The discovery of this field was based on geologic structure and guided by gravimetric measurements. At present 13 shafts are in the process of reaching depths of from 3000-6000 ft to reach the ore. Diamond drilling is still extending the limits of the goldfield.

Lead and Zinc

Straddling the international boundary and extending from British Columbia through Washington and down to the Coeur d'Alene district of Idaho is one of the largest lead-zinc provinces of the world. The Coeur d'Alene district has long been a great producer of these metals in the past and as the old mines become deeper, new mines are being brought into production, frequently by deep development programs based on more complete geologic understanding. Such has been the history of the development of the silver-copper-lead belt extending east from the Sunshine mine. The Federal Mining & Smelting Co. with Day Mines, Inc., is sinking the Galena shaft to a depth of 3000 ft; it has now reached about 2600 ft, and will explore at this depth veins which were not productive above. Three miles farther east, Hecla Mining Co. is studying the same zone. During 1949 work was limited to bulldozer exploration and surface mapping. The Sunshine Mining Co. is actively developing several adjoining claim groups by long crosscuts.

In Stephens County and Pend Oreille County, Wash., lead-zinc deposits have been undergoing rapid development for some years. Mines Management, Inc., has developed more than a million tons of commercial ore at its Iroquois mine during 1949. Pend Oreille Mines & Metals Co., American Zinc, Lead & Smelting Co., and Metaline Mining & Leasing Co. are the principal producers. Impetus to development was given by recent drilling by both private companies and by the Bureau of Mines.

Over the border in British Columbia, the Reeves MacDonald claims some 3,000,000 tons of ore in a partially developed property. The Salmo district, as it is called in British Columbia, also includes the Jersey lead-zinc mine where over a million tons of ore averaging 3.4 percent lead and 6.7 percent zinc have been developed by drilling with a large potentially productive area still to be drilled. This deposit was developed by detailed structural analysis followed by drilling.

To the north of the Salmo district, in the Slocan district, an extensive program of mapping is being undertaken by Paul Billingsley for Kelowna Exploration Co., and Consolidated Mining & Smelting Co. is conducting a mapping program in St. Mary River basin.

Encouraging results are being obtained by a large drilling program at Pine Point, Northwest Territories, Canada. Some 30,000 ft of scout drilling has been done. In the area, 25 miles by 2-3 miles, it is hoped to develop sufficient tonnage to warrant a smelter.

Returning to the United States, International Smelting & Refining Co. has been investigating Tintic, Ophir and American Fork districts in Utah, and with Humphyreys Corp. and J. W. Patterson is starting work at Aspen, Colo. American Smelting & Refining Co. has been developing the Leadville district in depth.

Beside geological studies accompanied by diamond drilling at Edwards-Balmat, N. Y., St. Joseph Lead Co. has been conducting a careful geologic program in southeastern Missouri. Although the results appear promising, nothing is being published.

In Wisconsin near Schullsburg, Calumet & Hecla Consolidated Copper Co. has developed 2,000,000 tons of 6 percent zinc ore by drilling. Production has started from the South Hayden ore body.

At Pioche, Nev., Combined Metals Reduction Co. is continuing its general development of ore channels by drilling.

Buchans Mining Co., Ltd., in Newfoundland, has discovered a new ore body by drilling. It is said that it will add eight years life to the property. In the meantime Buchans is studying its holdings in detail.

Although little can be learned of results of prospecting and development in Africa, Tsumeb is developing and exploring. Drilling below the 20th level at Tsumeb was sufficiently favorable to warrant a new shaft.

Near Aachen, Germany, at the Maubacher-Bleiberg mine, low grade lead-zinc ore is being developed. To date the ore is averaging 3 percent lead and 2 percent zinc. It occurs in Triassic conglomerate and although only 28,000 tons has been developed the deposit is by no means delimited.

The Zellidja district straddles the boundary between French Morocco and Algeria. Although certainly not new in 1949 its development into a lead-zinc district of great promise has taken place in part during that year. Development is in part due to the participation of Newmont Mining Corp. and St. Joseph Lead Co. The mine has been mechanized and a 4000-ton mill is being built.

Ventures, Ltd., has acquired the Greek Laurium deposit in Greece. A flotation plant is being built to treat the lead-zinc tailings from ancient operations, and the company will commence underground development.

There are reports of the first lead discovery for New Zealand and for Greenland but nothing has been published of their extent.

Iron and Titanium

Except for the period when the Mesabi range was first opened, exploration is going on in the iron country at a pace never before equaled. New deep ore has been found in the Gogebic district and recent discoveries have brought to light new ore in the Iron River-Crystal Falls district. Discoveries are putting two new tons of ore in reserve for each three tons mined.

Development continues to enlarge the reserves in New York State. Republic Steel has developed 23,000,000 tons of new ore at its Chateaugay mine.

In Canada over 300,000,000 tons of high grade iron ore have been developed by drilling in the Quebec-Labrador range and this tonnage will be tremendously increased when the large remaining geologically favorable area is tested.

North of Sault Sainte Marie the Goulais magnetite and Michipicoten siderite deposits are said to contain one billion tons of potential ore. Goulais is said to have developed 150,000,000 tons from drilling only part of the range, and Michipicoten 400,000,000 tons.

In Venezuela, Bethlehem and U. S. Steel have been developing large reserves of high grade hard hematite ore. Tonnage figures have not been published but must be large since Bethlehem is said to have invested approximately $50,000,000 to bring the deposit to production.

Republic Steel has gone to Nigeria for its future iron ore reserve. A reserve of 20,000,000 tons has been developed in a small part of the concession.

Development of the Allard Lake titanium deposits has continued on a large scale by Quebec Iron & Titanium Corp. By March of 1949 they had developed 112,000,000 tons of ore averaging 32 percent Ti O_2 and 36 percent Fe.

The exciting new finds of iron and titanium ores are due in large measure to the skillful application of geology and geophysics with the willingness of the mining companies to spend money on extensive exploration programs. If there is ore to be found this combination will find it.

Manganese

The Bureau of Mines has developed many millions of tons of ore averaging 12 percent manganese and 20 percent iron in Aroostook County, Maine. Metallurgical research will now try to discover a method of making this material commercial. The same government agency will investigate the Artillery Peak deposit in Mohave County, Ariz.

Large manganese deposits are being investigated in the sparsely-settled, tropical regions of Brazil.

Nickel

The Lynn Lake nickel property in Northern Manitoba has been undergoing development by Sherritt Gordon Mines, Ltd., for some years. During 1949, however, the reserves have been increased by shaft sinking and drilling from the 1000 level. The drilling has shown that the "A" ore body continues to at least the 2000 level. Indicated reserves are 10,500,000 tons of about the same grade as previously announced.

The International Nickel Co. has optioned claims at Mystery Lake, where a 70 by 350-ft outcrop of massive sulphides averages 0.9 percent nickel. Geological mapping will proceed by drilling through the ice this winter.

Rare Earths

Near Mountain Pass Service Station, 33 miles northeast of Baker, Calif., an important discovery of rare-earth minerals was found in April 1949. The valuable mineral is bastnasite, a fluo-carbonate of cerium and lanthanum, with small amounts of thorium and uranium. The largest of the five veins which occur in an area of 600 by 1500 ft is 15 ft wide and contains 20-30 percent bastnasite. D. Foster Hewett, who examined the property for the U. S. Geological Survey, said: "There can be no doubt that the lodes of the area are a potential commercial source of cerium and lanthanum, the present supply of which is derived from monazite, a mineral largely imported" (MINING CONGRESS JOURNAL, December 1949).

Tin

At its Llallagua mine, Patino Mines & Enterprises Consolidated, Bolivia, has been carrying out experiments to determine the feasibility of block caving certain areas of the mine, as at Butte. A rough estimate of the tonnage of ore to be caved is 25,000,000 tons of 0.7 percent tin. Metallurgical tests are also being made on millions of tons of sorting plant rejects averaging about 0.6 percent tin, and on 7,000,000 tons of tailings averaging .55 percent tin. If tin can be produced from these low grade materials commercially, it is the equivalent of the discovery of a large ore body.

Near Port Moresby in New Guinea, Mandated Alluvials N. L. expects to prove 1,500,000 tons of payable tin ore. It is said that the ore is amenable to flotation.

Tungsten

The Isle of Pines,[6] of the southwest coast of Cuba, is said to show strong ferberite ($Fe\ WO_4$) veins. Surface trenching and underground work has shown an oreshoot on No. 18 vein 1000 ft long varying from 0.1-3.9 percent WO_3. The average width is 37 in.

Uranium

Development of the carnotite field in Colorado, Utah, New Mexico and Arizona has progressed intensively during the year under the auspices of the U. S. Geological Survey and U. S. Vanadium Corp. and Vanadium Corporation of America.

At Marysvale, Utah, a deposit of autunite has been found which is said to assay from 0.36-0.76 percent uranium. It has been drilled along 800 ft of a 30 deg open slope to a depth of 135 ft (MINING CONGRESS JOURNAL, December 1949).

Uranium ores are also reported by Charles H. Dunning, director of the Arizona Department of Mineral Resources, from the Hillside mine near Prescott and from Hacks Canyon in northwestern Arizona.

In Kittitas County, Wash., a vein of uranium-bearing ore has been found on Fortune Creek, 27 miles above Roslyn. The ore is said to contain about 2 lb of U_3O_8 per ton.

Near Boulder, Colo., on the 1040 level of the Caribou mine, pitchblende has been found. Bulk samples from a 15-ft raise are reported to have assayed 2-3 percent U_3O_8 and about 1000 oz silver.

Pitchblende has also been found in non-commercial quantities on the 3100 and 3700 levels of the Sunshine mine and also in the workings of Coeur d'Alene mines.

The Sunshine Mining Co. has taken working agreements with the Elkhorn Mining Co., Mont., to prospect the Enterprise group of claims where radio-active reactions were obtained with the Geiger counter.

In Canada work continues on the Camray pitchblende deposit in Ontario on the north shore of Lake Superior but has not gone far enough to prove whether the ore bodies are commercial.

From British Columbia come two reports of uranium discoveries. Western Uranium Cobalt Mines, Ltd., at its mine near New Hazelton reports the presence of uranium in commercial quantities. The mine had been worked for gold and cobalt.

The Little Gem mine in the Bridge River district also reports interesting quantities of uranium in a gold-cobalt ore.

Saskatchewan is developing uranium discoveries that may be important. At Lake Athabaska, Nicholson mines, it is reported, has a length of 180 ft with the following values over a 3 ft width: 1.71 percent uranium oxide, 0.31 oz gold with some silver and platinum. Several other discoveries have been made in the same district.

Near Telford, 80 miles east of Winnipeg, Manitoba, there has been a discovery of uranium which has caused the staking of many claims. Uraninite with thorium has been identified but whether the deposit is commercial has not been determined.

More than a million tons of zinc ore have been developed at the Iroquois mine of Mines Management, Inc.

The Outlook for New Discoveries

Of course many discoveries of mineral deposits made in the past year have not been included in the above tabulation. It takes a long time after discovery to make a mine and a longer

(*Continued on page* 88)

[6] Paul A. Bundy, Cuba Has Potential Tungsten Mines, E. & M. J., August, 1949.

Labor Negotiations in Metal Mining

Room for Improvement Exceeds Past Achievements

By JAMES K. RICHARDSON
Manager
Utah Mining Association

WAGE negotiations in the nonferrous metal mining and smelting industry remains, to a large extent, in such a nebulous state as to suggest the advisability of crystal gazing. Certainly many companies have hurdles to cross before contract negotiations are terminated. A great deal of the anticipated difficulty will, indirectly, arise from the internal strife currently tearing at Mine-Mill; inter-union politics; and inter-union membership drives with rosy promises yet to be fulfilled.

No one can truthfully say that a pattern has been set within the industry. This condition exists because the working of the free enterprise system with the industry has been uninhibited by governmental price supports which have, largely, in the past been adjusted to meet and encourage pattern wage developments. Furthermore, the bulk of the industry found itself at contract termination dates with an operating condition that ran contra-clockwise to the rosy pink haze of "planned economy" and forced the individual operator to look at his hole card in an attempt to survive economically. No emergency, stimulated by patriotic sentimentality, existed. The hard and irrevocable laws of supply, demand and survival forced an aggressive and demanding viewpoint upon an industry that had been pushed around by governmental interference in negotiations until it was suspected, in some quarters, that it had lost its collective "guts."

These termination dates found some confusion existing within the ranks of labor and industry alike. The predominant union in the industry, the International Union of Mine, Mill and Smelter Workers, was fighting a losing battle with public opinion as well as with its parent, the Congress of Industrial Organizations, for its adherence to communistic ideologies.

Its membership was being raided by various CIO and AFL unions, but particularly by the aggressive Progressive Metalworkers Council. Many locals were on strike for recognition, and many members had been out of work through deference to picket lines set up by other organizations. Topping it all, Mine-Mill's treasury was sadly depleted!

Mine-Mill Stand Balks Realistic Bargaining

The mining industry had suffered the shock of precipitous metal price declines. Test votes upon the Taft-Hartley Act had stunned a pro-labor administration which had promised full repeal. Despite this over-all chain of events 75 representatives of Mine-Mill met in Denver on March 15 and developed a national bargaining policy that indicated either a lack of realism or a desire to foment further distrust and class hatred.

This policy called for a 25¢ per hour wage increase; insurance and welfare benefits for employes and their families; pension plans; an anti-air contamination program designed to gain community support in smelting areas; and various other standard "demands."

In July, Mine-Mill's executive board voted to have its officers sign the non-Communist affidavit in order to open the door to NLRB recognition. This was its only hope of forcing negotiations upon employers who had previously refused to bargain on the grounds of Mine-Mill noncompliance with T-H requirements. Maurice Travis, secretary-treasurer of Mine-Mill, announced his resignation from the Communist Party on August 15 "with a great sense of indignation." This announcement came as a genuine shock to many of the true trade unionists in IUMMSW who had been firmly indoctrinated with union propaganda to the effect that all these tirades against Communism were management-inspired. Some local officials, embarrassed and disillusioned, resigned and urged others to follow their lead. Others, thoroughly imbued with the spirit of America, have stuck with their union in the hope that American ideals would prevail. Through their individual leadership, they hoped to save Mine-Mill from itself. These men deserve high praise for they are, unquestionably, subject to the vilest abuse the entrenched leadership can heap upon them. Mine-Mill's annual convention in Chicago is reported to have had 350 delegates present—its ranks depleted by the issue of Communism.

A CIO committee headed by Jacob Potofsky started hearing charges, on January 18, that Mine-Mill has been following Communist policy rather than that laid down by CIO. The outcome of these hearings may well determine Mine-Mill's future as a dominant trade union in the metal industry.

The Progressive Metalworkers Council, Mine-Mill's most aggressive opponent, has its membership made up almost entirely of locals and trade unionists who have seceded from Mine-Mill over the Communist issue. These locals have been, recently, urged to affiliate with the United Steel Workers. Although a substantial number

of locals have so affiliated it is thought that more may take this step as soon as CIO definitely decides the fate of Mine-Mill. There seems to be no question, however, that the nonferrous metal mining industry will face USW, on a larger scale, during negotiations next year.

This series of events could only lead one to expect a confusing situation to exist with respect to bargaining in 1949. Let us look at what has taken place.

MONTANA—The Anaconda Copper Mining Co. was the first major producer to lead off in 1949 wage negotiations. This company had, previously, closed some of its mines due to the price of nonferrous metals and was in no mood to argue points that could only result in higher operating costs. The only subject of negotiations, this year, was that of wages! At the contract termination date no agreement had been reached but, shortly afterwards, Mine-Mill and other CIO unions voted on the company offer of continuing the existing contract and wage rates until June 30, 1950. This was accepted by the rank and file by a large majority and on July 12 an operating agreement to this effect was signed by the company and the CIO unions. Shortly thereafter a similar settlement was made with all the craft unions of the AFL.

To the "pattern-minded," this settlement offered some hope. But realistic signs had earlier indicated that all bargaining would, eventually, work down to individual economic problems due to the fact that patterns, in the past, had been largely stimulated by metal subsidies.

UTAH—In Utah, the Kennecott organization had undergone a shutdown due to a strike of the Brotherhoods. In 1948, this same company had refused to bargain with Mine-Mill until it had complied with the Taft-Hartley non-Communist affidavit provision. The contracts expired on June 30, 1948, and were not renewed. By agreement between the company, the union and Federal and state conciliators, the provisions of the expired contracts were continued as past practice.

Mine-Mill had only one contract of any significance in effect and that was with the International Smelting and Refining Co. In this particular case neither party exercised the reopening clause and the contract existing in 1948 continued in effect insofar as all contractual conditions were concerned.

The Park City operators faced the Progressive Metalworkers Council which had taken over the Park City local of Mine-Mill when they seceded over the Communist issue. Preliminary talks indicated that PMC demands were substantially the same regarding wages as those developed by Mine-Mill. These increased cost items were economically impossible for the Park City operators to meet and the PMC negotiators were told that substantial wage decreases would be necessary for the mines to continue in operation. The operators asked that the union accept a $2.50 per day wage reduction and PMC refused. All the principal producers were forced to close. Only one of these, the New Park Mining Co., has reopened to date. Since then, operators offered a sliding wage scale that was rejected.

The U. S. Smelting Refining and Mining Co. originally asked PMC unions to accept a daily wage decrease of $1.96 and the Tintic District operators asked for a $1 cut. These were rejected by PMC. In the case of the U. S. Smelting operations, the company made a new offer to continue existing wage scales until December 31, 1949, with each party permitted one reopening on January 1, 1950. This offer was accepted and meetings are being held to discuss wages as each party has exercised reopening prerogatives. The Tintic's principal operator, the Chief Consolidated Mining Co., made no issue over the wage demand due to its widespread use of contract systems. The old contract on wages was renewed.

On August 19, Kennecott's Utah Copper Division signed a contract with the Brotherhood of Locomotive Firemen and Enginemen ending the recessed strike. This contract covered all conditions of employment but recognized the continued existence of a dispute over wages.

Following the signing of non-Communist affidavits by Mine-Mill international and local officials, negotiations have been entered into with Kennecott. These negotiations are currently being carried on. The press points out that representatives of Kennecott's employes in Nevada and New Mexico are joining with those in Utah to form strategy and policy with respect to bargaining on a company-wide basis.

Kennecott's Operating Engineers and the International Association of Machinists were recently offered a 5¢ per hour wage increase and an expansion of the existing group insurance program to include off-the-job accident and sickness benefits. IAM has accepted the offer, but the Operating Engineers have neither accepted nor rejected it.

TRI-STATE DISTRICT—The Tri-State district of Oklahoma, Kansas and Missouri, hard hit by metal price declines, faced economic extinction unless immediate cost economies were effected. The first move came from the Nellie B. Mining Co. at Cardin, Okla. A blanket cut of 75¢ per day was put into effect on March 31. On April 14, blanket cuts amounting to $1.50 per day were fairly general in the district. By May 7 only two companies (Eagle-Picher and Federal) with Mine-Mill contracts were operating in the district under the old wage scales. All others with Mine-Mill contracts had

Good ventilation improves underground working conditions

Efficient equipment attracts skilled miners

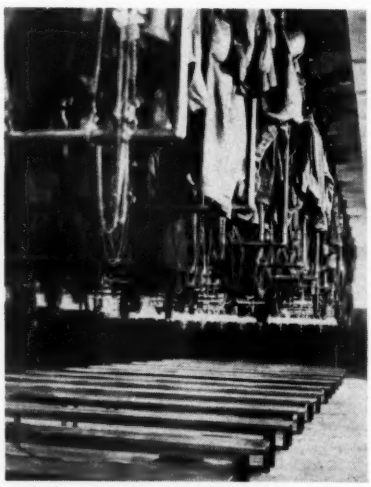
been forced to close. Those not having such contracts had reduced wages approximately $2 per day. By June 6 the Federal operations had been forced to close, leaving Eagle-Picher as the only district operation that had not reduced wages. Those then operating had effected wage reductions varying between $2.25 and $2.75 per day. The St. Louis Smelting and Refining Co., after a month shutdown, reached an agreement with Mine-Mill whereby they could reopen with a wage reduction of $2.25 per day based on a $75 per ton zinc concentrate market. Any further market change, up or down, would cause increases or decreases of 8¢ per day for each $1 change in zinc concentrate price.

On June 14 the United Cement, Lime and Gypsum Workers (AFL) was certified as bargaining representative of Eagle-Picher's Tri-State employes, replacing Mine-Mill. When this bargaining agent refused to accept a $3.08 per day wage reduction, based on a similar sliding scale, Eagle-Picher's Tri-State operations were forced to close on June 30. After several "back-to-work" movements, in which the pleading of local leadership was ignored, the sliding scale plan was resubmitted to the membership for ratification and it was accepted and a new contract was signed August 5 permitting the reopening of operations.

SOUTHEASTERN MISSOURI—In Southeastern Missouri, employes returned to work after the strike at St. Joseph Lead Co. Two elections were held to determine the bargaining agent and both resulted in a "no union" vote that precluded another election for a year. "Peace prevailed" until October 3 when Mine-Mill petitioned NLRB for an election. The ballot carried the names of Mine-Mill; Gas, Coke and Chemical Workers; and "no union." Neither union received a majority of the votes cast due to the "no union" votes which has necessitated a run-off. Mine-Mill, however, came within 65 votes of receiving the majority but the competing union promptly filed an unfair labor practice charge against St. Joseph Lead Co. for having instituted a 62½¢ per day cut in the price of lead bonus. This action made a run-off election impossible until NLRB had disposed of this charge that gave the weaker union some opportunity to bolster its forces in the hope of making a better showing in the new election.

COEUR D'ALENE DISTRICT—The Coeur d'Alene operators began negotiations with Mine-Mill early in June. Original discussions indicated that the operators felt that wage cuts and work-week reductions were necessary for economic operations. The first proposal on wages was for the district to revert to the wage scale in effect on May 1, 1946. This date was selected due to the fact that metal prices on that date approximated those then in effect. This proposal was rejected and the union refused to modify demands for wage increases. A conciliator was requested by the operators who had agreed to maintain existing wage scales and conditions until July 9 even though no contract would be in existence after July 1. The work of the conciliator produced no tangible results and on August 3 the employes authorized a strike to enforce demands. The Sunshine Mining Co. had offered employes a renewal of the existing contract on a six-day work week basis but was caught in the district-wide strike vote and threatened to file unfair labor charges against Mine-Mill for not submitting its offer to Sunshine employes for independent vote.

Following this strike threat all operators offered a six-day work week and the then existing wage scale. Upon submission of this offer to the various locals in the district, Local 9 at Mullan voted to accept the proposal. Locals at Wallace and Kellogg rejected it. Negotiations were resumed on August 17 but were recessed without agreement until August 24. On August 20 a strike was called at the Bunker Hill smelter. In the meantime new contracts had been signed between the Mullan local and Federal's Morning Mine and the Lucky Friday Mining Co.



Adequate "dry" facilities are essential

On August 31 Bunker Hill was forced to close its mine and mill due to the smelter strike. This closure was followed by others and approximately 2600 men were out of work.

A "back-to-work" movement developed among the local officers of Local 18. Disregarding the opinions of the IUMMSW representatives, Local 18 officials met with representatives of Bunker Hill, the Page Mine, and some small Pine Creek operators. On November 2 they agreed upon a contract providing for a six-day work week; a contributory medical and surgical benefit plan for dependents; a contributory "off-the-job" accident and sickness plan; and a contract running until 1951 on economic issues and until 1952 on non-economic ones. After much fighting within the Local the matter was submitted to a referendum vote on November 12. The rank and file accepted the offer and thus ended an 84-day strike at 11 companies holding contracts with Local 18.

Negotiations were immediately resumed by Local 14 and a referendum vote taken November 19 by the membership of this Local, on the basis of an offer essentially the same as that made Local 18, resulted in an almost four-to-one acceptance and brought an end to the strike.

COLORADO—Two of the principal operators in the Leadville area, the Climax Molybdenum Co. and the Resurrection Mining Co., signed contracts with the AFL. Climax reduced its work week to five days but did not reduce wages. Resurrection's contract provides for a wage decrease of $1 per day effective January 1, 1950, which will be restored when the combined lead-zinc price reaches 28¢. A combined price beyond this figure can result in a higher wage than was in existence in 1948.

Idarado's contract with UMW was not reopened by either party; wages being based on a sliding scale which has resulted in decreases. The U. S. Vanadium Corp.'s negotiations with UMW, early in 1949, with respect to their Rifle operation, resulted in a 6½¢ per hour wage increase with some added fringe benefits. This contract, which runs until February, 1951, calls for negotiation on the question of wages, union security and check-off by February 25, 1950.

WASHINGTON—Preliminary negotiations between Mine-Mill and Howe Sound's Chelan Division resulted in a five-day work week when the union rejected a $2-per-day wage cut. The company reinstituted a six-day work week at the 1948 scale upon the signing of a "memorandum of agreement" on November 8, which runs until June 30, 1950.

Also in Washington, the American Zinc's operation at Metaline Falls reopened, September 6, after having been closed by a strike since July 1, 1948. This strike resulted from American Zinc's meritorious and consistent stand in connection with their refusal to bargain until Mine-Mill signed the non-Communist affidavit. The contract agreed upon was to be the same as in existence in the Coeur d'Alene's prior to July 1, 1949, with the provision that wages were to follow the Coeur d'Alene scale during the contract's life.

ARIZONA—In Arizona all eyes have been focused upon Phelps Dodge. This company recently settled with their AFL unions by granting a 5c-per-hour wage increase. It is understood

that the same settlement was reached between Miami Copper and their craft unions, but this has not as yet been confirmed. Neither of these companies have reached an agreement with their Mine-Mill employes to date. Eagle-Picher, which negotiated first in Arizona, kept wages the same but did some reclassification that resulted in an over-all increase of between 2¢ and 3¢ per hour. Shattuck Denn and St. Anthony renewed old contracts without wages being affected.

CALIFORNIA—In California, the Darwin Mine, upon reopening, renewed its old contract with Mine-Mill without change. Nothing has developed at Bishop between the Union and the U. S. Vanadium Corp. where the last negotiations were held on October 5.

California operators are, however, greatly interested in the negotiations which have been going on between the American Potash and Chemical Corp. and Mine-Mill. Their old contract called for wages only to be discussed at the reopening permitted on December 1, but Mine-Mill's demands have run the gamut of issues. There had been evidence of dissatisfaction among the employes with the leadership of IUMMSW due to the Communism issue, but a recent election of Local officers has held the Local in the confines of IUMMSW. This election, however, will unquestionably result in new negotiating committees being appointed. This has temporarily stalled negotiations.. Their last meeting was held on November 9. It is felt that an attempt will be made to bring wages and working conditions at Trona to a point more closely comparable to those existing in the potash producing area of New Mexico.

NEVADA—The Combined Metals Reduction Co. and the PMC local continued the existing contract in effect without change. Kennecott's negotiations are about in the same status as in Utah, insofar as Mine-Mill is concerned.

NEW MEXICO—Negotiations of national significance, insofar as Mine-Mill is concerned, have been concluded in the Carlsbad, N. M., area between the Union and the potash producing companies. These were particularly significant because it was felt that Mine-Mill was using the 2000-odd potash workers as guinea pigs to "determine its strategy in the forthcoming interunion battle for the control of locals," and to strengthen its nationwide debilitated condition. In pushing its wage demands it called an area-wide strike. Strikes are strange to this area which, 15 years ago, was supported by a basic agricultural economy. The present strike resolved itself to name calling, injunctions, and other unpleasant airing of personalities, which did the cause of trade unionism little good. The employes in the area, before the strike, were averaging $2.05 per hour with average annual earnings of $4,200 per year. In addition there existed retirement annuities which provided the average worker, at age 65, with $100 per month in addition to social security benefits; $4,000 group life insurance; five days' paid sick leave per year; holiday and vacation pay; hospital and medical benefits for the employe and his family; off-the-job accident and sickness disability benefits and similar other factors which made his working conditions and contract the best in the mining industry. Despite these facts Mine-Mill has asked for a $2.00 per day wage increase which has been rejected by the bargaining companies. The companies had, however, offered a cost of living increase to offset a rising future index in the event the employes accepted the present wage scales. IAM and IBEW have both accepted this offer and contracts have been signed with them.

Other New Mexico producers are currently negotiating but no agreements have been reached.

SMELTING—The most spectacular of labor problems came to a head in the nonferrous smelting industry when American Zinc signed with Mine-Mill at its Fairmont Plant after having consistently refused to bargain until the non-Communist affidavit was signed. The strike that resulted from this action in 1948 was terminated September 6 after receipt of notices that the Union was in full compliance with the Taft-Hartley Act and a contract signed. The contract, according to press reports, "assures labor peace until July 1, 1951" and provides that differences in contract interpretation will be settled by a three-man commission. Wages remained the same as those the employes were receiving at the time of the strike but there will be a general wage increase of 13¢ per hour to all employes on the payroll on January 1, 1950. This increase is the same as that earlier given employes at other smelting units of the company.

There were few wage increases given in the nonferrous smelting industry during 1949. It should be remembered, however, that the principal "gas belt" smelters gave a fourth round, 13½¢ per hour increase, in 1948, as a result of an original wage arbitration finding at National Zinc's Bartlesville plant. Midwest smelters, in order to line up with the "gas belt" increase, granted 13¢ increases.

The Bartlesville smelter had a second wage arbitration early in 1949 in which the arbitrator awarded retroactive pay for the period December 3, 1948, to April 5, 1949, but not to extend beyond April 5, based upon "the fact that the zinc prices in effect during that period warranted increased wages to the employes." Their present contract, however, keeps wages the same as were in effect following the aforementioned fourth round increase. Mathiessen and Hegler, while maintaining the same rate, provided for an increased pay scale in event zinc prices increase to 10½¢ per pound.

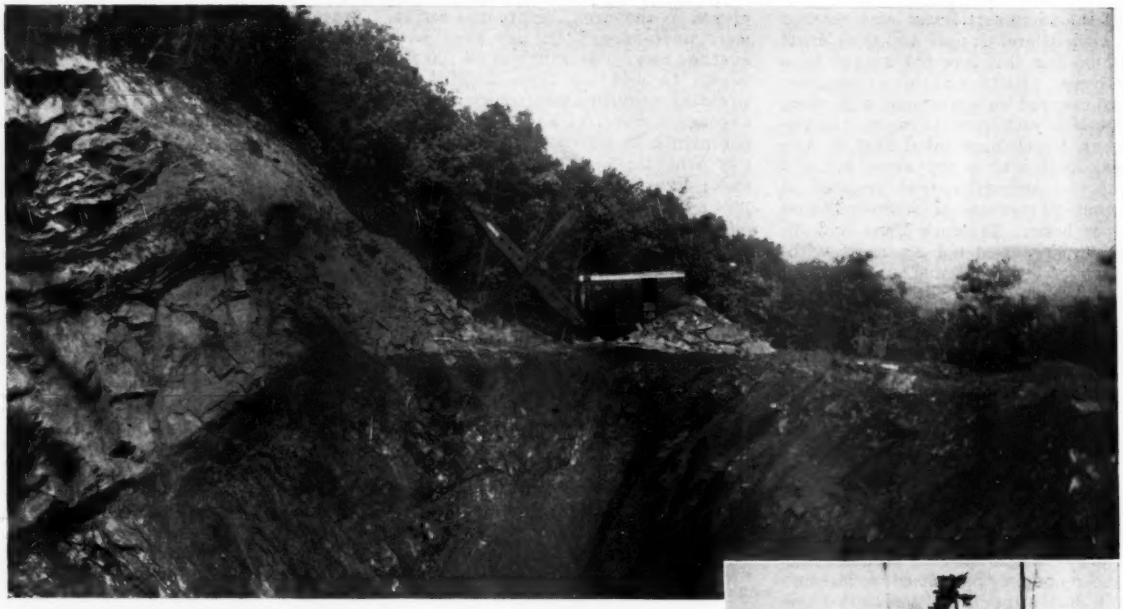
At St. Joseph Lead Co.'s Herculaneum smelter, an NLRB election certified CIO's Federation of Glass, Ceramic and Silica Sand Workers as bargaining agent. A contract with this union was signed September 16.

A strike is currently in progress at the Selby plant of the American Smelting and Refining Co. Mine-Mill has here asked for the complete package of wage increases and fringe benefits. There is much speculation as to whether this action is a strictly local affair or not, for it seems to be out of keeping with Mine-Mill's announced policy of company-wide actions.

Subsidies and Controls

While the over-all picture of labor-management relations may be confusing, it is not too discouraging from a long-range viewpoint. This statement is based upon the fact that there appear to be clear-cut indications that labor is becoming honestly aware of the economic abilities and characteristics of individual operations, the absence of which has characterized past bargaining. Disturbing is the fact that union membership has urged Federal incentives to the metal mining industry which previously had been used to bolster wage demands and led to "pattern bargaining." Despite the controversial nature of this particular issue, one can foresee little constructive benefit accruing to the industry in the way of development and exploration if the principal portions are to be used in subsidizing labor. Labor must realize that with such subsidization there is injected an undesirable element of Federal control, a hazard recognized by the entire mining management group.

All indications are that our industry should intelligently and honestly seek to develop a better understanding of labor's economic problem and work toward its solution In attempting to be of real assistance to labor it is imperative that labor be truthfully apprised of the dangers of this direct approach to individual economic security that is embodied in the trend to "statism." The public, too, must thoroughly appreciate and understand the part a free and healthy mining industry plays in national welfare as well as in the life of the community. These objectives can be realized if we make a genuine effort to disseminate factual information, in a friendly and sincere manner, and by our becoming a participating citizen of the community rather than, ostrich-like, hiding our heads in the sands of past achievements.

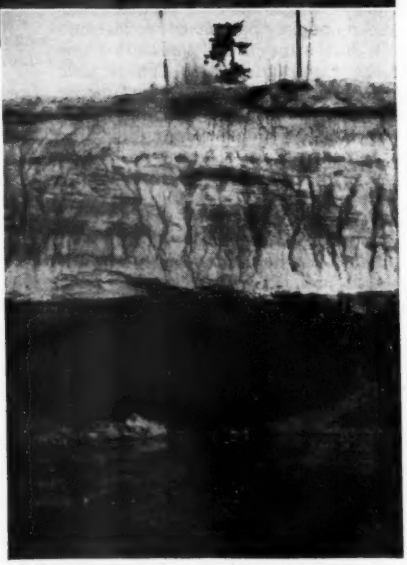


The Lykins Valley bed, Western Middle Basin, Pennsylvania anthracite field where the USGS is engaged in mapping the geology and structure

Status of Coal Resources Surveys*

Dependence on Coal Leads to Extensive Reappraisal of Reserves

By PAUL AVERITT
Chief, Coal Resources Section, Fuels Branch
U. S. Geological Survey



Typical coal bed and sandstone encountered in drilling the Tono strip pit, Tono, Wash.

GEOLOGIC work on coal resources completed or in progress in the United States in 1949 was greater than that of any previous year since before World War I and includes not only detailed geologic mapping of coal beds and intervening rocks, but studies of roof rock, overburden, mined-out areas, exploratory drilling and estimates of coal reserves as well. The reasons for this general upsurge of interest are readily apparent. Whatever the precise quantitative expression of our coal resources may eventually prove to be, it has been obvious for generations that we do possess enormous reserves. Then, too, the ready availability of petroleum and natural gas has led to the rapidly increasing use of these convenient fuels with a corresponding diminishing percentage contribution of coal to our over-all heat and power requirements. Under these circumstances we have relaxed in the comfortable assumption that our coal deposits are virtually boundless.

Within the last few years, however, it has become apparent that petroleum and natural gas reserves are not limitless, so the realization has come that we should take a hard look at previous appraisals of coal resources and reconsider their adequacy to meet greatly increased energy requirements. Geologists have a large responsibility in supplying the urgently needed basic information about coal resources, and to continue supplying and reviewing it in the future. This responsibility is being met.

Detailed Mapping of Coal Beds

Any approach to the study of coal resources is based on the detailed geologic study of coal fields. The scope of these studies has gradually broadened with each generation of geologists, and will show marked improvements in the near future. The scale of geologic mapping in coal-field areas

* Presented before the Society of Economic Geologists, El Paso, Texas, November 1949.

is, for example, trending toward 1/24,000 or 2000 ft to the inch, which offers many advantages in the presentation of detail. Similarly, the more recent geologic studies in the coal-field areas are devoting more attention to the nature of the roof rock; to overburden, particularly as it affects strip mining; and to lateral variation in the constituents of coal. In addition, the newer geologic studies of coal-bearing areas typically show mined-out areas, and include detailed appraisals of the coal reserves by individual beds and by categories of thickness and overburden. That further improvement in the geologic mapping of coal-field areas is in prospect is attested by the fact that courses in coal geology and coal botany are now being offered by many universities.

An extensive program of detailed geologic mapping is now in progress in most of the coal producing states, carried on by the various State and Federal agencies. On some projects, the various agencies make independent surveys and reports, but on others, two or more work in cooperation. The following accounts give a fairly accurate cross-section of the programs now under way throughout the coal fields.

State Investigations and Surveys

In Pennsylvania a study of geologic structure is in progress in the western middle Anthracite basin by the U. S. Geological Survey in cooperation with the Pennsylvania Topographic and Geologic Survey. In addition, detailed geologic maps are being made by the Pennsylvania Topographic and Geologic Survey in the central and south central Pennsylvania bituminous fields. Across the state line, the Maryland Department of Geology, Mines and Water Resources, is continuing the study of the Garrett County field, mapping the geology and investigating the coal resources. This latter project is a completion of an examination previously made in the western part of Maryland by the Maryland Department of Geology, Mines and Water Resources, in cooperation with the U. S. Geological Survey and the Bureau of Mines.

In Ohio an extensive program of geologic mapping by the Geological Survey of Ohio is in progress, covering ten counties; some maps have already been published, some are on the press, others are in manuscript form, while in the remainder the field work is well under way. These reports are scheduled for completion in 1950. A stratigraphic study of the Monongahela formation, including maps and descriptions of the coal beds, is scheduled for completion in 1952. Supplementing these studies, the Ohio Survey also collects and maintains systematic records of coal test borings.

The Kentucky Geological Survey and the U. S. Geological Survey, have inaugurated a program of coal investigations on which work has already started in the eastern part of the state. The Tennessee Division of Geology is engaged in a program of detailed mapping in coal field areas. In Alabama, the Geological Survey of Alabama, in cooperation with the U. S. Geological Survey, will soon publish a bulletin which will supersede a preliminary map of this area published in 1948. The University of Alabama, through its Bureau of Business Research, is preparing a report on the iron and steel industry in the southeastern states which will include the coal resources of Alabama, Georgia and Tennessee. In North Carolina, a detailed preliminary report by the USGS on the geology and the coal resources of the Deep River coal field was completed and published in June 1949.

In Indiana the Indiana Division of Geology, in cooperation with the USGS, has embarked on a comprehensive program in the coal field which, in addition to the usual geologic mapping, includes reconnaissance studies of the coal resources. In Illinois, many detailed county coal reports are in preparation by the Illinois State Geological Survey Division. These studies are accompanied by charts and tables showing all pertinent base data about the coal seams —their thickness, elevation and depth underground. To facilitate these studies, the Illinois Survey examines and prepares logs of all available diamond drill cores made by mining and engineering companies. In addition to deep mining, the Illinois Survey is also making studies on strip-mining possibilities.

In the Midwest the State Geological Surveys of Iowa, Kansas, Oklahoma and Arkansas are investigating the coal resources and making stratigraphic studies in the coal-bearing parts of these states.

In the Rocky Mountain region, and on the west coast, much of the geologic work on coal currently in progress or in press is carried on by the USGS. Studies in progress, or recently completed, cover the Knife River field, and Missouri-Souris area of North Dakota, Powder River field of Montana, the Spotted Horse field of Wyoming, the Yampa, Durango, Trinidad and Paonia fields of Colorado, the Chaco River district of New Mexico, the Grassy field of Utah and Lewis-Thurston Counties of Washington.

Exploratory Drilling

Exploration and development drilling for coal is largely a function of private operators. In many states the volume of such drilling is large, and the logs of the holes constitute both a valuable geologic record and a reliable means of evaluating coal resources. Several state surveys, notably those of Illinois, Ohio and West Virginia, and possibly several others, systematically collect and maintain records of company drilling for coal. Certainly these records, like the records of oil and gas wells, and seismic shot holes, should be collected and preserved, and this is one of the many valuable functions carried out by the state surveys.

When carried on in conjunction with geologic mapping, exploratory drilling for coal is an extremely effective means of establishing correlation, extent and structure of coal beds in the area examined, and of predicting variations in thickness and nature of the seams, and of the roof rock. On two of the projects listed above the Yampa project in Colorado and the project in Lewis-Thurston Counties in Washington—the USGS is carrying on simultaneously both geologic mapping and exploratory drilling, with beneficial

Anderson bed, Powder River County, Mont., as seen during recent detailed mapping

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results. Cores from these holes are used also by the Bureau of Mines for examination and analysis of the coal.

As an emergency measure during the war, the Bureau of Mines inaugurated a program of exploratory and development drilling in areas of potential coking coal. Results of this program, now published for the most part, have yielded much valuable information about coal resources. The last project undertaken as part of this program was in western Maryland, where drilling was concluded in February 1949, after 26 holes had been completed. This work was coordinated with detailed geologic mapping by the USGS and the Maryland Department of Geology, Mines and Water Resources. Reports are still in preparation.

Miscellaneous Special Studies

Several interesting studies being carried on in conjunction with other more routine coal-resource investigations are now in progress in different parts of the United States. The West Virginia Geological and Economic Survey, in cooperation with the Roof Action Committee of the American Mining Congress, is making a study of roof rock with special relation to "roof bolting." This survey also has developed a special diamond saw for taking column samples, and is engaged in the systematic collection of samples for botanical, petrographic and spectrographic tests, aimed towards devising procedures to aid in establishing coal correlations.

The U. S. Forest Service, the State Forester of Pennsylvania, the State Geological Survey of Kansas and the Geological Survey of Missouri maintain, more or less systematically, maps of stripped-out areas, that aid greatly in preparing coal-resource appraisals.

Workers in several states, some of the staffs of state surveys, some in local departments of geology, are engaged in studies of the botany and petrography of coal, which have application to studies of coal resources, particularly in establishing correlations between beds.

The U. S. Geological Survey is currently engaged in establishing at Ohio State University a coal geology laboratory, intended to facilitate coal resource studies, in part through paleontological and petrographic work, and in part through improvement in the field of observation of coal beds.

Estimation of Coal Reserves

Detailed geologic mapping projects provide new data that can be used to prepare estimates of coal reserves in the ground. All of the USGS projects, for example, will yield appraisals of the reserves in each bed divided into several categories according to the thickness of the bed, the amount of overburden and the reliability of the information. Appraisals of reserves based on new mapping and exploration are quite apart from another phase of coal resource investigations covered by the heading "estimation of coal reserves." The war-induced shortage of oil, so recently experienced in this country, focused attention on the pressing need for new summary appraisals based on currently available information of coal reserves by states and counties, or other units. Much has been said and written about this subject, and notable progress has been made, which is summarized in the following accounts.

The U. S. Geological Survey, in 1949, published new and fairly comprehensive appraisals of the coal reserves in North Carolina and Montana. These estimates are presented in much greater detail than earlier estimates, and are, correspondingly, more useful. Work is well advanced on similar appraisals of the coal reserves in New Mexico, Wyoming and Michigan. The Indiana Department of Conservation, Division of Geology and the USGS have embarked on a cooperative program to estimate the coal reserves of Indiana. The West Virginia Geological and Economic Survey is engaged in revising the estimate of coal reserves in West Virginia prepared by that agency in 1940. The Geological Survey of Ohio has prepared a new estimate of the coal reserves in Perry County, Ohio. The Illinois State Geological Survey Division, and the State Geological Survey of Kansas also have work in progress that will permit the preparation of new reserve estimates for those states at any time.

The Coal Branch of the U. S. Bureau of Mines currently is preparing estimates of minable reserves of coking coal in certain of the Appalachian States, notably West Virginia, Pennsylvania and parts of eastern Kentucky. Similarly, the Army Corps of Engineers is engaged in preparing estimates of reserves of coal and other fuel and power resources in 37 states and Alaska, aimed toward the eventual selection of cites for the construction of synthetic liquid fuel plants. This work is being done on a contract basis by the private engineering firm of Ford, Bacon and Davis, Inc., with the coal-reserves appraisals made by Paul Weir Co., subcontractors. Representatives of the two firms currently are working in many coal-bearing states.

The National Bituminous Coal Advisory Council has recommended to the Interior Department standards for use in summary studies of coal reserves, such as thickness ranges, maximum overburden and related factors that should do much to bring about uniformity between different agencies engaged in coal reserves work. This group has been responsible for much of the current interest in coal-resource investigations.

Conclusion

Coal resources investigation is a continuing job that grows in scope with each additional bit of information. Estimates of total coal reserves based on today's information although interesting and valuable are undeniably only provisional appraisals. They can be improved only through new detailed geologic mapping and exploratory drilling. This, unfortunately, is the hard way, for detailed geologic studies are arduous and time-consuming, and exploratory drilling is expensive. It is certain, however, that improvements in the technique of mapping and correlating coal beds, and improvements in methods of exploration, ultimately will bring about great improvement in the knowledge of coal resources. It is hoped that these studies can be continued at an accelerated rate until the job is finished.

Mining Geology

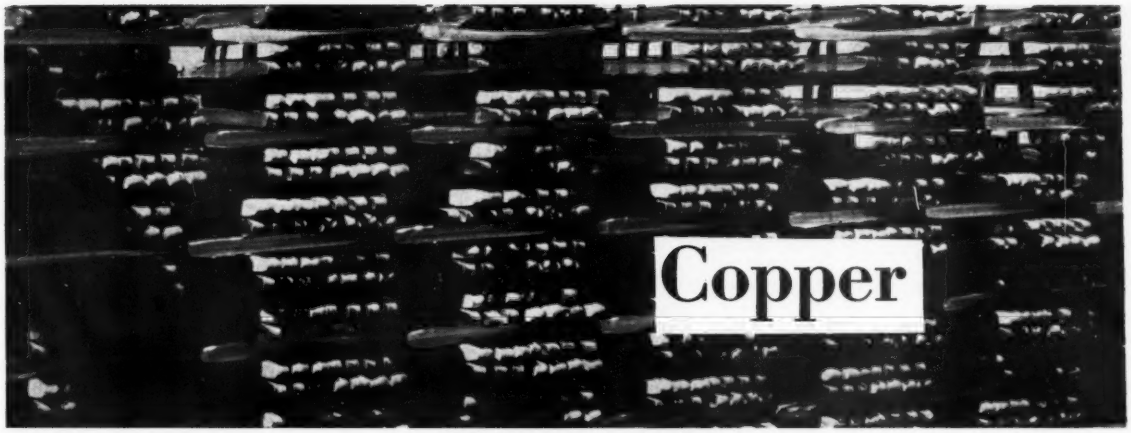
(*Continued from page* 81)

time to develop a great ore deposit or district. It is noteworthy, however, that few new districts are being developed within the United States compared with the relatively unexplored or unprospected regions of the globe, such as Canada and Africa. These regions are in the vigorous youth of their mineral industry; the United States is passing over the crest. The easily found ore bodies have been found, developed, and in many cases mined out.

The future of American mining depends primarily on whether the mining geologist can find new deposits, on whether the metallurgist can develop new processes so that leaner ores may be utilized, or on whether substitutes will be developed for scarce metals.

It is the geologist's responsibility to find the new deposits whether of present grade of ore, or leaner ore not now commercial, or deposits of a substitute metal. The present tendency or trend to study detail both in structure and mineralogy as a means of discovering more about the solutions from which the ore bodies were formed is a step in the right direction. More laboratory research is needed in conjunction with trained chemists. The aid of the various geophysical and geochemical processes, which are rapidly developing, will be of great help as they become more certain in their interpretations.

My debt to the many geologists and engineers, who have contributed to this review by letter or by articles written during the year, is gratefully acknowledged.



Wire bars ready for market

Wide Fluctuations in Demand Experienced in 1949

By E. O. SOWERWINE

Vice-President
Anaconda Copper Mining Co.

THE most striking feature affecting the copper industry in 1949 was the abrupt reduction in the early part of the year of purchases by the real consumers, the customers of the primary fabricators. Their purchases had averaged 114,333 tons in 1948 and doubtless would have been much larger if more copper had been available. There had been no indication of any decrease in demand, nor of any change in the general situation that had prevailed during the war and the postwar period calling for maximum production at home and abroad in a determined effort to furnish an ample supply. Some consumers had secured more copper by buying scrap and having it refined on toll at ultimate cost much higher than that charged by the regular sellers of electrolytic copper. There had been no intimation of inventory accumulation by consumers, but apparently such was the case as purchases from the fabricators declined sharply each month with April 68.5 percent less than December 1948 and with no return to normal until September 1949.

To clarify the situation, it may be appropriate to define "consumption" as that term is generally used in the industry. There are three phases of consumption, each of which had been practically identical with the others for several years;—(1) tonnage delivered by the producers to the primary fabricators, (2) tonnage delivered by the fabricators to their customers and (3) actual consumption as measured by the quantity of copper going into use in new buildings, automobiles, machinery, electrical manufacture of every variety, power, light and telephone lines, screens and countless other items down to needles and pins.

Normally the copper producer is primarily interested in the first yardstick, as his direct responsibility is limited to production and sale of the copper in the form of wire bars, ingots, slabs, billets and other shapes cast at the refinery to best meet the requirements of the primary fabricators. For many years these data have been most accurately compiled and published by Copper Institute. Nothing is omitted. Statistics show, not only for all the mines, smelters and refineries in the United States, but for the entire world (with the exception of Russia and certain non-reporting countries) mine production, secondary production at

TABLE I—UNITED STATES COPPER
(Tons of 2000 lb)

	TOTAL					PRIMARY			
	PRODUCTION		DELIVERIES			PRODUCTION		DELIVERIES	
	Refined	Crude	Producers to Fabricators	Fabricators to Consumers	Secondary to Refineries	Crude	Refined	Producers to Fabricators	Fabricators to Consumers
1947	976,698	1,196,393	1,383,666	1,338,383	105,307	871,391	1,091,086	1,278,359	1,233,076
1948	980,498	1,233,697	1,344,445	1,394,307	130,410	850,088	1,103,287	1,214,035	1,263,897
1949	907,652	1,056,463	1,031,595	1,055,885	135,039	772,613	921,424	896,556	920,846
Jan.	69,438	78,298	94,070	109,551	16,372	53,066	61,926	77,698	93,179
Feb.	76,941	80,275	97,861	93,474	18,190	58,751	62,085	79,671	75,284
Mch.	97,123	88,165	113,154	89,834	17,867	79,256	70,298	95,287	71,967
April	91,589	93,873	76,134	65,461	15,886	75,703	77,987	60,248	49,575
May	81,258	98,139	32,566	61,383	10,555	70,703	87,584	22,011	58,828
June	72,051	92,118	45,653	71,124	8,412	63,639	83,706	37,241	62,712
July	62,449	83,638	45,316	61,220	6,089	56,360	79,549	39,227	55,131
Aug.	62,279	85,577	90,739	88,088	6,349	55,930	79,228	84,390	81,739
Sept.	64,870	79,949	103,113	114,760	7,410	57,460	72,539	95,105	107,350
Oct.	69,052	86,882	108,192	106,928	6,277	62,775	80,605	101,915	100,651
Nov.	80,598	92,602	117,133	107,965	13,119	67,279	79,483	104,014	94,846
Dec.	80,004	94,947	107,662	86,097	8,513	72,491	86,434	99,149	77,584
Monthly Average ..	75,637	88,038	85,966	87,990	11,253	64,384	76,785	74,713	76,737

		Fabricators	
		Sales to Consumers	Purchases from Producers
1948	Average	114,333	110,562
"	December	118,822	114,521
1949	January	94,594	96,202
	February	65,062	101,953
	March	61,323	106,294
	April	37,394	21,482
	May	40,442	26,640
	June	56,240	40,648
	July	91,020	68,769
	August	66,884	96,145
	September	106,089	112,024
	October	101,467	127,337
	November	116,219	124,478
	December	92,207	107,946
	Total	928,941	1,029,918
	Average	77,412	85,827

the refineries, refined production, stocks on hand, sales, and finally deliveries to fabricators. But in a period of readjustment, such as was witnessed in 1949, such deliveries are not a true index of consumption.

Purchases Curtailed in Spring and Summer

Statistical data are regularly compiled by the United States Copper Association which supplements that of Copper Institute and reveals in addition the amount of copper on hand at the fabricating plants in form of the various shapes received from the refineries and the total quantities in process and in finished form ready for shipment to consumers. These data also show sales to consumers and actual tonnage delivered. It is one step nearer the desired goal, but does not show actual consumption. In fact statements made by some of the large consumers of copper indicate that although their purchases had been greatly curtailed and their inventories reduced by large percentages, they actually used as much or more copper during the spring and summer as they did during the periods when their purchases were averaging in excess of 100,000 tons per month.

Unfortunately, data are not compiled by any private or governmental agency to show actual consumption of copper. In view of the thousands of manufacturing plants in the United States who use copper in their finished products it is impracticable to expect an accurate picture of consumption, unless those users would regularly report to their primary sources of supply the amount in their inventory at beginning and end of each calendar month, or at least on a calendar year basis. It will be necessary, therefore, to continue to rely upon the reports of the United States Copper Association as the most reliable index.

Accepting the statements of the consumers before the Congressional Committees, it may be assumed that consumption in the United States in 1949 averaged at least 100,000 tons per month. Demand originates with the public and works up through the manufacturers to the fabricators, to the producers. The maladjustment of this demand in 1949 is shown in the tabulation of sales and purchases by the fabricators, in tons of 2000 lb.

As a result of their greatly diminished sales, purchases by fabricators dropped from 106,294 tons in March to 21,482 tons in April, or, after allowing for secondary production in those months, from 88,427 tons to only 5596 tons of primary copper, compared with domestic primary production of 75,703 tons in that month. The natural result was a strenuous effort to repeal the legislation suspending the tax on imports of foreign copper. This shortsighted action by the consumers might well have proven very expensive over the long run by freezing into the price structure a permanent import tax on copper which would have exerted a steady and continuous upward pressure on price in view of the impossibility of domestic production meeting the requirements of U. S. consumers except in a period of real depression, such as is not foreseen. Fortunately this action by Congress was averted by an improvement in demand, purchases by consumers and fabricators alike showing steady increases and establishing new highs for 1949 in the last four months of the year.

Production in the United States might have been somewhat higher in recent years if there had been no strikes or interference beyond the control of the producers and if there had been a compensatory price to cover increased cost of wages, supplies and other factors. However, production was not materially reduced by strikes and actual production may well be considered as indicative of the future, as the same factors will doubtless recur.

Dependence of United States industry on foreign copper is clearly shown by a comparison of actual production of domestic copper (including secondary metal delivered to the producing plants) with deliveries by the primary fabricators to consumers.

To this demand by consumers must be added the amount purchased by the U. S. Government as a start on building up a stock pile as insurance against any future national emergency. Such

TABLE No. II
FOREIGN COPPER
COPPER INSTITUTE—TONS OF 2000 LB

	Total				Primary		
	Production		Deliveries to Fabricators	Secondary to Refineries	Production		Deliveries to Fabricators
	Crude	Refined			Crude	Refined	
1947	1,238,820	1,016,856	921,851	8,995	1,229,825	1,007,861	912,856
1948	1,280,410	1,072,229	901,073	8,526	1,271,884	1,063,703	892,547
1949	1,280,670	1,076,114	933,641	10,237	1,270,433	1,065,877	923,404
Jan.	113,205	96,210	77,546	891	112,314	95,319	76,655
Feb.	107,142	87,004	74,327	967	106,135	86,037	73,360
Mch.	120,729	100,686	85,750	904	119,825	99,782	84,846
Apr.	112,002	96,513	75,424	1,268	110,734	95,245	74,156
May	114,526	96,743	79,644	581	113,945	96,162	79,063
June	111,181	97,449	86,475	681	110,500	96,768	85,794
July	98,960	81,277	71,333	488	98,472	80,789	70,845
Aug.	92,936	84,304	76,634	311	92,625	83,993	76,323
Sept.	100,303	82,946	74,615	443	99,860	82,503	74,172
Oct.	105,797	85,150	75,391	1,696	104,101	83,454	73,695
Nov.	105,858	84,571	78,898	1,036	104,822	83,535	77,862
Dec.	98,031	83,261	77,604	971	97,060	82,290	76,633
Monthly Average	106,722	89,676	77,803	853	105,869	88,823	76,950

Tons of 2000 lb	1947	1948	1949
Deliveries by fabricators to consumers	1,338,383	1,394,307	1,055,885
Domestic production	976,698	980,498	907,652
Deficit	361,685	413,809	148,233

purchases are very small to date, only a fraction of the amount owned by the Government when active warfare ceased but which was sold to consumers, and in the aggregate are probably less than three months' requirements based on experience during World War II.

	1947	1948	1949
Stock pile purchases	79,892	14,927	178,161
Deficit for manufacture	361,685	413,809	148,233
Total deficit	441,577	428,736	326,394

Due to physical limitation of ore reserves, copper production in the United States could not be increased by the amount of these deficits even if there were no interference with production, if there were no increase in any cost factor and if the price were firmly fixed at the highest quotation since the Civil War.

Although consumers' stocks are never revealed, it is probable that they were materially decreased during 1949. No record of stocks held by foreign fabricators or consumers is available. All refined stocks held by producers and by U. S. fabricators reached a high for the year on September 1, but at the close of the year were less than those on hand at the beginning of the year.

From the above it will be noted that although producers' stocks in the U. S. increased 19,947 tons during the year, this increase was more than counterbalanced by 24,290 tons decrease in stocks of fabricators, resulting in a net decrease of 4,343 tons. Decrease during the last four months amounted to 80,788 tons. Producers' stocks outside the U. S. decreased 27,697 tons and total stocks decreased 32,040 tons.

Details of production and deliveries in total, and of primary copper alone, after deduction of scrap, are shown on Table I. Domestic primary production was nine percent less than in 1948 with even larger decreases in deliveries.

Price Fluctuations

During 1949 the price of copper, Connecticut Valley delivery, was 23.5¢ per pound to March 30, declining to a low of 16¢ from June 17 to July 5 and recovering to 18.5¢ on November 4 to the end of the year. E. & M. J. quotations are lower by 0.3¢ per pound to adjust freight rates to price received by the producers, fob refinery. Price changes and monthly average prices were as follows:

		Price Changes
March	30	22.950¢
April	14	21.200
	21	19.700
May	2	18.200
	9	17.975
	10	17.700
	11	17.750
	12	17.700
	13	17.600
	16	17.700
	25	17.325
June	9	16.700
	13	16.575
	14	16.200
	17	15.700
July	6	16.525
	7	16.700
	11	17.300
	12	17.325
Nov.	4	18.200

	Monthly Average fob Refinery
January	23.200¢
February	23.200
March	23.178
April	21.450
May	17.763
June	16.324
July	17.059
August	17.325
September	17.325
October	17.325
November	18.062
December	18.200
Year Domestic	19.202¢
Year Foreign	19.421¢

Copper at 23.5¢ per pound was not over-priced. The producing industry is entitled to a fair margin over cost of production. Cost is measured by wages, not only directly, but in the wages accumulated in cost of supplies, services, transportation, etc. It is doubtful if price would have declined below 23.5¢ if current purchases by manufacturers had kept pace with their actual consumption of copper. Wage increases have been general in all industries, steadily increasing costs and decreasing the purchasing power of the dollar. During 1935-1939 the price of copper was abnormally low, averaging only 10.45¢ fob refinery. That five-year period is used as basic 100 percent by the Bureau of Labor Statistics and for latest period available (October 1949) records average hourly earnings in all manufactures at an increase of 134.5 percent which would indicate comparable price for copper 24.51¢ fob refinery, or 24.81¢ delivered Connecticut Valley. The Bureau of Labor Statistics—All Commodity Price Index for December 1949, was 151.1 percent of 1926 base. This would indicate a fair increase in price of copper, fob refinery, from 13.795¢ in 1926 to 20.84¢ or 21.14¢ delivered to customer. Every index shows that present price of 18.5¢ is low, compared with prewar prices when correlated with all the factors of increased costs.

REFINED STOCKS IN U.S.A. (Tons)

1949	Producers Copper Inst.	Fabricators U. S. C. A.	Total U. S. C. A.	Producers Outside U.S.A.	Copper Inst. Total
Jan. 1	96,080	372,702	468,782	175,669	644,451
Sept. 1	217,167	328,060	545,227	152,840	698,067
Dec. 31	116,027	348,412	464,439	147,972	612,411

Foreign Copper Production

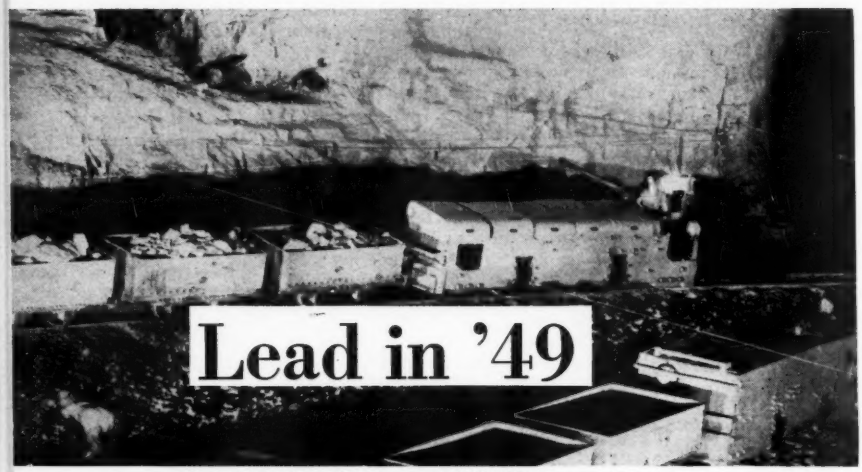
Production and deliveries of copper in foreign markets was remarkably uniform on a monthly basis in 1949 and quite similar to 1947 and 1948. Detail is shown in Table II. Production was almost identical with that of 1948, while deliveries to fabricators increased about 3.5 percent. The only important change geographically in the deliveries of copper was the diversion to the west of output of Yugoslavia from the countries behind the "Iron Curtain" thus increasing the supply available to the United States and those countries free from Russian domination.

For the first time in many years some indication of USSR copper production is available. Without indicating source or reliability of information, the *London Metal Bulletin*, January 3, 1950, reports production in long tons:

1944	170,000	1947	185,000
1945	160,000	1948	200,000
1946	170,000	1949	225,000

The Ecoonmic Cooperation Administration authorizations were an all-important factor in overcoming the dollar shortage in Europe in 1949. From the inception of this assistance, April 3, 1948, to December 31, 1949, total authorizations were $8,022,372,788 of which $502,356,357 were for nonferrous metals. Authorizations for copper and copper products amounted to $246,033,104 and for brass and bronze $7,100,000, a total applicable to the copper industry of $253,133,104 or 3.1 percent of total authorized. Paid shipments, cleared through ECA accounts to December 31, 1949, of all copper and cupriferous materials amounted to $191,600,000, indicating rather large

(*Continued on page* 96)



Lead in '49

Domestic lead production passed 400,000 tons in 1949

By CHARLES R. INCE
Manager, Metal Sales
St. Joseph Lead Co.

Prices Fluctuated as Shortages Vanished

IN 1949 the lead market underwent a transition from the abnormally tight situation of the previous year, in which consumers bid feverishly for the available supply, to the normal market wherein producers of lead were again seeking outlets for their metal. The transition was not accomplished without some sharp fluctuations in the market price for the metal. Starting the year at an all-time high at an established market of 21.5¢ per pound but with outside sales noted at 26¢, the price held for most of the first quarter but thereafter encountered the drop in business and liquidation of inventories which engulfed the country starting in the second quarter, and dropped rather precipitously to 12¢ a pound by the end of May. As sentiment changed about mid-year, there was an improvement in buying that carried the market to 15.125¢ but subsequent heavy imports of lead forced the price down by November to the previous low of 12¢, where it remained for the balance of the year.

This readjustment in price was not entirely unwelcome. No one relished the 21.5¢ plus price, least of all producers, as it was obvious that there would have to be a day of reckoning and in the meantime lead was being priced out of some of its markets, which would not easily be regained. Violent as the price adjustment may have seemed, a drop of 44 percent in a single year was not without precedent. There have been several years in the past when fluctuations of similar magnitude have taken place. As a matter of fact, the postwar adjustment year of 1920 recorded a drop of 48 percent. However, this does not mitigate the harmful effects of wide fluctuations on the business of lead consumers, the efforts of the custom smelters to balance sales against intake and the rapid shifting of marginal mines from a profitable to a nonprofit basis.

Such fluctuations as have occurred are due to no one group. Neither miners, smelters nor consumers are directly responsible but all three contribute their share. The smelter, whether it be primary or secondary, does not wish to speculate in the metal markets. Therefore, in order to protect his smelting profit he endeavors to sell promptly an equivalent of the metal to be recovered from purchased ores, concentrates or secondary materials. In a firm market, this is easy to do and so strong may the demand become, he will raise his price in order to encourage mine production and intake to his smelter. At other times, the reverse is true, the smelter may have difficulty in selling his production and unless he is willing to accumulate a stockpile, he will lower the price in order to encourage demand and retard intake. This accounts for many fluctuations in the metal market which are, however, unfortunately sometimes accentuated by the action of the consumer and user of lead on the one hand, and the shippers of lead-bearing material to the smelter on the other.

In a rising market the consumer and user tends to over-buy, building up inventory as a protection against shortage and further price advances. Conversely, in a falling market the consumer under-buys and liquidates inventory. Under such circumstances, it is difficult to gauge true demand as exemplified by actual consumption. On the production side, the miner and secondary metal dealer tends to hold back on shipments to the smelter on a rising market, as they naturally would like to obtain the highest prices possible for their product. On the other hand, with the slightest signs of weakness in the market, shippers unload their accumulation and the smelter finds himself with a sudden increase in intake and a sharp decline in sales. Under such circumstances, it is no wonder that fluctuations in metal prices have been extreme at times.

In retrospect, the lead market could hardly have acted otherwise in 1949. The following table contrasting 1948 and 1949 indicates the extent to which a "shortage" became a "plentiful supply."

From the point of view of supplies, the tonnage available in 1949 was practically unchanged from the previous year. Although secondary metal recovery was sharply reduced from the previous year's record tonnage produced under the incentive of 1948 high prices, the imports of lead in all forms were 20 percent higher. The larger imports were due to shrinking foreign markets for Western Hemisphere lead and the desire of many foreign countries to obtain dollar exchange for their devalued currencies, which amounts to 30 percent for South Africa and Australia, 40 percent for Mexico and 10 percent for Canada, and more than offsets the protection offered domestic mines by the reinstatement of the lead duty on July 1, amounting to 1-1/16¢ a pound or 9

UNITED STATES LEAD SUPPLIES
(In short tons)

	1948	1949, Estimated
From:		
Domestic ore	390,480	409,000
Foreign ore	64,170	105,000
Scrap	471,905	390,000
Imports of metal	254,068	272,000
Total supplies	1,180,623	1,176,000
Less:		
Increase in stocks at primary smelters and refineries	20,344	60,000
	1,159,279	1,116,000
Demand		
Industrial consumption	1,129,000	870,000
Change in consumers' stocks	+26,000	—15,000
	1,155,000	855,000
Apparent excess of supply over demand	4,279	261,000

percent ad valorem. Scrap accumulations from Germany and Japan also pressed on the U. S. market in 1949. Furthermore, the Yugoslav's "cold war" with Russia has had the effect of diverting Yugoslavian lead to western markets, a major part of which would have been shipped behind the iron curtain under other circumstances.

Government purchases for stockpile absorbed most of the surplus in 1949 and should continue to be an important factor in 1950. It is expected that purchases will continue at the 1949 rate until the end of the Government's fiscal year in June. Thereafter, it will depend on the Munitions Board's decision on the quantities needed for stockpile and the appropriations made by Congress during their current session. The consumption of lead in 1949 fell substantially below the decline in general industrial activity, dropping 259,000 tons or 23 percent below the previous year's figure.

Among the major lead-consuming industries, paint, cable, ammunition and bearings showed the most marked declines. The first two indicate to some extent the degree to which lead may have priced itself out of some of its markets. The high price of lead carbonate in 1948 and early 1949, coupled with tight supply, accelerated the declining use of that pigment in paint. The use of composition sheathing, combining lead and neoprene, as well as the substitution of lead by Alpeth in the cable industry was due not only to the high cost of the metal but the shortage which existed during the previous year. In the ammunition field, a marked drop of nearly 50 percent in lead consumption reflected to a large degree the use of shot that had been hoarded during the shortages of the previous two years. The decline of 35 percent in the bearing field was probably due to the enormous amount of bearing metal reclaimed from worn-out freight cars, over 80,000 of which were retired in 1949 compared to a normal rate of about half that number.

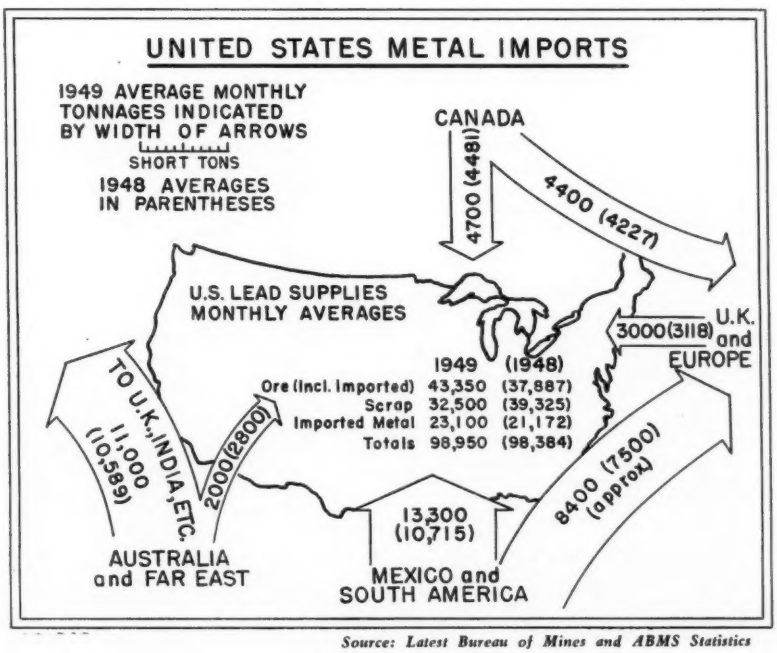
Consumption of lead by the storage battery industry declined to about the same extent as the general average for all lead-consuming industries and was just about in line with the drop in shipments of replacement batteries reported by the Association of American Battery Manufacturers. Whereas, 23,726,000 batteries were shipped in 1948, an estimated 18,500,000 based on 11 months' figures, were shipped in 1949, a drop of 22 percent. The one bright spot in the lead-consuming picture was the gasolene industry where an increase of 15 percent in the quantity of lead used for tetra-ethyl fluid was recorded. Indications are that the use of lead for this purpose will continue to grow with the demand for high-octane gas for the high-compression engines generally being adopted by the automotive industry. Figures released by the Bureau of Mines show that octane rating for premium-price gasolene rose to 88 last summer as compared with 86.1 and 85.9 in the two previous summers.

With regard to the future of the lead market, there are many artificial and unpredictable influences that could affect its course. Mining subsidies could contribute to an already overbalanced supply. Conversely, Government stockpiling can continue to alleviate the pressure from such overproduction. ECA activities will influence the market for lead in Europe and, under recent loans and grants, will certainly affect the production abroad which will have its repercussions in this country. However, at the year's end general business was on the upturn. From a low of 155 in mid-November, the Business Week Index had climbed by December 31 to 192, within seven points of the peak which prevailed at the first of the year. Assuming lead follows the trend we can reasonably expect a pickup in consumption of 10-15 percent against the 24 percent drop in 1949. On this basis, we would require between 950,000 and 1,000,000 tons of lead, exclusive of stockpiling. Stockpiling on a more moderate scale than this year's rate could bring total requirements to over 1,100,000 tons in 1950. A price of at least 12¢ per pound would be required to provide the supplies of lead to meet such a requirement. Indications are that we have passed the peak of offerings from abroad, and as world conditions improve, European demand for metals should again provide the market for Western Hemisphere lead that has been seeking outlets in this country.

LEAD CONSUMPTION *

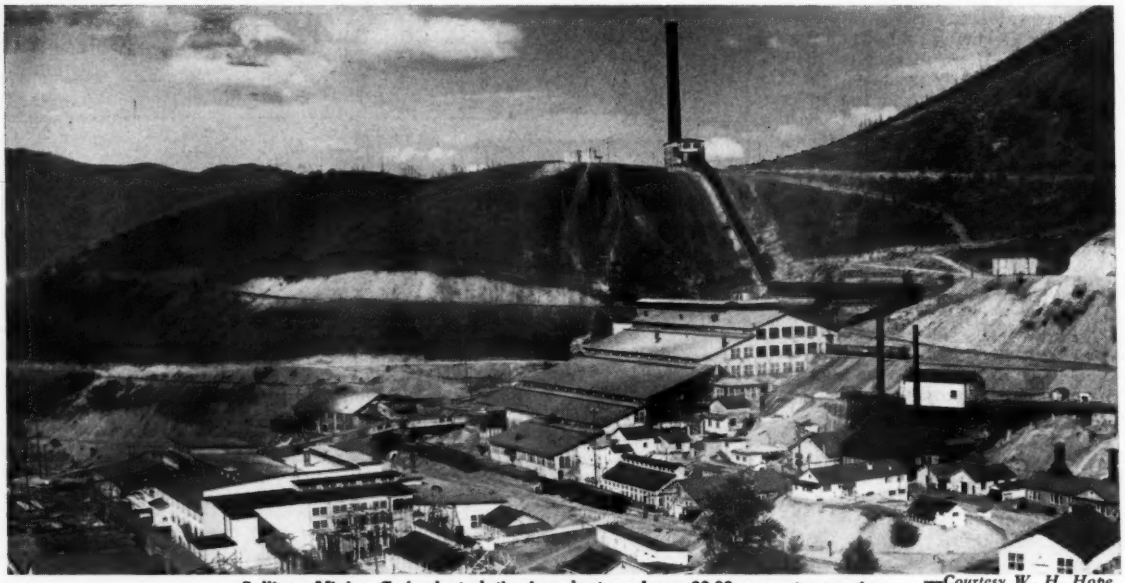
	1948	1949 Estimated	Change from previous year
White lead	34,300	23,000	—33%
Red lead and litharge	58,900	55,000	— 7%
Storage batteries	373,300	285,000	—24%
Cable covering	184,300	112,000	—39%
Building	60,800	51,000	—16%
Tetra-ethyl	83,800	96,000	+15%
Ammunition	42,400	22,000	—48%
Foil	3,100	3,000	— 4%
Bearing metal	41,500	27,000	—35%
Solder	67,500	59,000	—13%
Type metal	28,700	25,000	—13%
Caulking	40,200	35,000	—13%
Other uses	110,200	77,000	—30%
Total	1,129,000	870,000	—23%

* Source: Lead Industries Association.



Source: Latest Bureau of Mines and ABMS Statistics

Lead flow in 1949



Sullivan Mining Co.'s electrolytic zinc plant produces 99.99 percent pure zinc —*Courtesy W. H. Hope.*

Zinc in 1949

Output for Year Up Despite Severe Price Fluctuations

By W. G. WOOLF
Superintendent
Electrolytic Zinc Plant
Sullivan Mining Co.

SINCE zinc is a basic industry, it naturally followed the general trend of the durable goods industries in 1949, a year of readjustment to normal markets following a period in which production had caught up with accumulated war-time demand. Despite price setbacks and strikes, it is rather surprising that domestic zinc metal production in 1949 of 864,000* tons exceeded 1948's production of 850,105 tons.

An important consideration to everyone interested in the zinc industry is the fact that the United States continued in the past year to import a considerable percentage of its total zinc requirements either as concentrates or as metal. The latest figures available from the Bureau of Census, those for January-October, inclusive, indicate that imports supplied 38.5 percent of the apparent United States consumption—imports of foreign ore (zinc content) supplying 22.8 percent and shipments of slab zinc 15.7 percent for that period. Final figures for the entire year, it can be assumed, will not vary greatly from the stated percentage figures. Also, it must be noted that these percentages do not take account of zinc in ore of approximately 100,000 tons per year used directly for manufacture of pigments.

Since there was an over-supply in excess of 100,000 tons of zinc metal in 1949, it is again not surprising that the zinc price should decline from 17.5c at the start of the year to a low of 9c in June, from which it recovered to 9.75c by reason of the improved industrial activity that commenced in July. After the adverse effect of the steel strike on zinc consumption, and consequently on quotations, the price again advanced in December to the year-end quotation of 10c.

There was a decrease in domestic consumption of zinc in 1949, varying in amount among the different consuming industries. Final figures for 1949 are not available at this writing but an estimate indicates the following decreases from the previous year: galvanizing 5.5 percent, die casting and zinc-base alloys 19.0 percent, brass products 31 percent, rolled zinc 22 percent, zinc oxide and other uses 23 percent.

1950 Mine Output May Decline

Domestic mine production of zinc was lower in 1949 than in 1948. The latest Bureau of Mines production figures available, through October of 1949, indicate that the average monthly total United States production for that period was 95.3 percent of the average monthly production of 1948. Production in the year 1949 was adversely effected by strikes and metal price declines. Particular districts felt these effects more severely than did others—some to the extent of almost complete shut-down, and the same is true of individual mines in certain districts. Marginal producers resorted to selective mining of their higher grade ores and curtailed development. Decreases in mine production in recoverable zinc were more pronounced in the later months of the year, and unless the economics of the zinc mining improves in the present year over that which existed in the last quarter of 1949, the mine output for 1950 will be still further diminished over recent past years. Domestic mines are feeling the effects of intensified foreign competition brought about not only by currency devaluation but by the present governmental policy of encouraging imports, including the low-duty provisions under the Reciprocal Trade Agreements program.

We still have sufficient domestic smelting capacity for our entire zinc requirements but present indications are that there will be a shortage of domestic concentrate supply. In the recent past imports of zinc concentrates supplemented domestic supply to the smelters. However, competition in foreign markets with European zinc is becoming increasingly great. It is possible that the coming year will see some of the hitherto imported concentrates smelted abroad and the products sent into the United States with the present duty provisions.

* Estimated, based on latest figures available; the accurate figure available from American Zinc Institute's statistics around January 8.

Under the stress of decreased metal prices, rising wage rates and increasing costs of supplies, mine operators are striving to offset the resulting greater production costs by lower-cost methods of mining, installation of labor-saving machinery and other improved items of equipment. Similarly, modernization and progress in milling to gain the same ends are likewise being initiated. A discussion of these matters is given elsewhere.

Metallurgical Developments

No radically improved reduction processes were introduced into practice during the year although experimental work continued on improvements in roasting and smelting.

A possible innovation is contained in patents issued the past year to the American Metal Co. for a process of smelting by establishing a fluidized mass of finely comminuted zinc-bearing material, effecting reduction by means of finely divided coal, removing impurities from the bottom of the fluidized mass as these form and settle during the reduction. The zinc is recovered from the gaseous affluent volatilized from the fluidized mass.

Further progress is reported in the pilot plant operation of the Basic Reduction Co. at Henderson, Nev. This company has been working since August 1948 on a caustic leaching process for the recovery of lead and zinc from certain oxidized ores. It is reported that a high extraction of these metals is obtained in the leach, and that a practically complete separation of the lead and other metals is made from the solution before recovery of zinc from the solution by electrolysis. It is stated that the zinc does not adhere to the cathodes but is recovered from the bottom of the cells as a sludge of coarse crystals which can be easily washed, dried and melted into zinc metal. It is stated also that power efficiency of the electrolysis is high. The caustic leaching solution is regenerated for reuse. Caustic losses in the wash leach residues are reportedly kept under 20 lb per ton of ore.

The process was originally developed by the U. S. Bureau of Mines at its Boulder City, Nev., laboratory, and the recent pilot plant work has been done by Basic Magnesium Co. under a cooperative contract with the Bureau. The pilot plant is located in one of the former magnesium units of Basic Magnesium Project where Basic Reduction Co. expects to erect a commercial plant in 1950, taking advantage of the low cost of power and available water of the area. Basic Reduction Co. states that power amounting to about 130,000,000 kwhr per year has been allotted to it.

United States patents have been granted to National Smelting Co., Ltd. covering a process in which zinc vapor produced in a blast furnace is brought into intimate contact with molten lead or molten alloy rich in lead at a temperature below 500 C. The molten lead or alloy is circulated as a liquid, the condensed zinc is separated in the course of the circulation, and the lead or alloy is used again for the condensation of further zinc vapor. An apparatus for carrying out this process is also described.

It is reported that the American Metal Co. at its Blackwell, Okla., plant is converting its roasting procedure by the installation of sintering machines to roast raw concentrates direct by mixing returned sinter with the green ore. The sintering machine has wide pallets. It is said to be patterned after an installation in Belgium by the Prayon Co.

Another company, it is reported, is doing some roasting work in rotary kilns, with interesting results.

It is stated that at the Amarillo, Texas, zinc smelter of the American Smelting and Refining Co. mechanical charging machines have been introduced by which the amount of ore per cubic foot of retort capacity is increased. This charging device is patented.

No outstanding developments in electrolytic zinc practice have been announced during the past year although refinements and improvements especially to reduce labor costs have been put into effect. An item, in this respect, of considerable interest is the continuous casting of slab zinc.

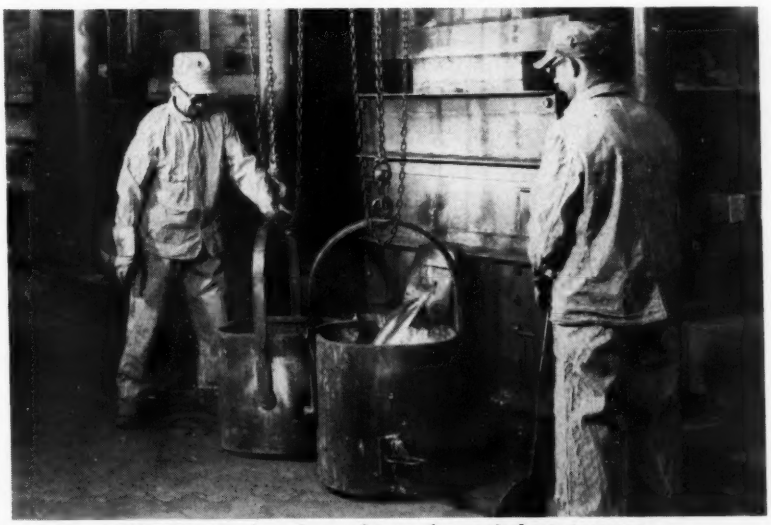
The Hudson Bay Mining and Smelting Co. at Flin Flon, Manitoba, is proceeding with the installation of a zinc fuming plant for reclaiming zinc from its electrolytic zinc plant residues, and further work on specific details of the process to be used has been carried out during the past year.

Metallurgists of the New Jersey Zinc Co. published in 1948 a description of a new type condenser in which a motor-driven impeller fills the condensing chamber with a continuous shower of molten zinc to scrub the the gas-vapor stream. The molten zinc bath has immersed in it loops of steel pipe through which water is circulated to control the temperature. A unit with only 28 cu ft of gas volume will efficiently condense ten tons of zinc per day.

New Alloys Developed

Revere Copper and Brass, Inc. have patented zinc-base alloys which are stated to be of high strength, non-aging and have high impact resistance. These alloys are produced by adding copper 0.5-5 percent and manganese .06-.75 percent. Alloys containing less than 2.35 percent copper are further stabilized by the addition of silver, .03-.25 percent.

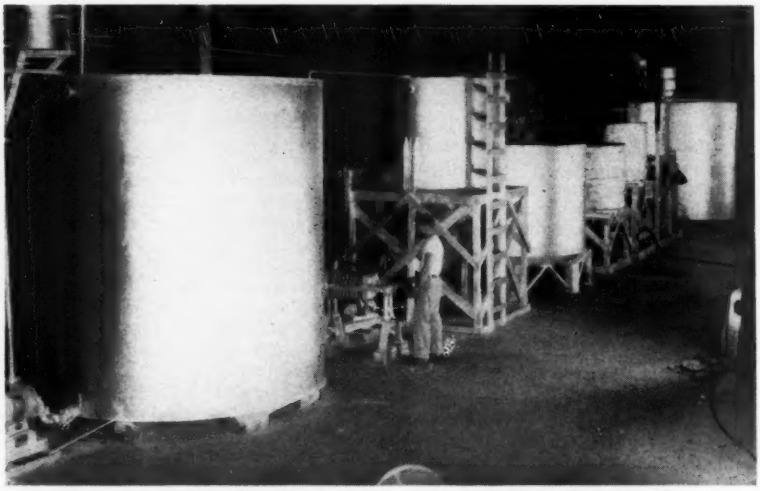
An interesting patent issued the past year to the New Jersey Zinc Co. describes zinc-base alloys containing titanium .05-5 percent and cadmium 0.1-1.0 percent which are said to possess superior creep-resisting properties. It is claimed that when zinc containing less than 0.1 percent lead is used, a fine grain size results in the cast alloy but a higher lead content gives a coarse structure which can be removed by mechanical working. Titanium additions may be made through use of an intermediate alloy containing about 4 percent titanium prepared in a clay-carborundum crucible at 800 C for eight hours. A description is given of a typical alloy containing 0.1 percent titanium and 0.5 percent cadmium that was rough-rolled to 0.09 in. in ten passes after heating the slab to 230-260 C and cold-rolled on warm rolls in five passes to 0.018 in. with a final coil temperature of 90-130 C. Scleroscope hardness was 20 as rolled and 17.5 after annealing for five minutes in oil at 275 C. Tempers were 55 and 48 before



Tapping zinc from the condenser of a vertical retort furnace

and after annealing. Similarly tensile strengths of 24,800 psi and 27,200 psi and tensile elongations of 45.3 percent and 32.2 percent were obtained.

An important development in the brass industry was the placing in operation of a continuous strip mill capable of producing flat bars for cold rolling into strip and sheet. As the brass emerges from the machine, it is automatically sawed into bars of uniform length, each weighing in excess of 2000 lb. Important refinements in strip and sheet brass are said to be thereby achieved.



View of leach and purification pilot plant of the Basic Reduction Co.

High Purity Zinc Tonnage Increases

Various reviews of the industry for past years have pointed out the trend toward increasing production of higher purity zinc metal because new capacity recently built is largely designed for such production; and some writers have predicted in the comparatively near future a substantial reduction in the output of prime western, having in mind the closing down of several horizontal retort plants in the recent past. Production figures for 1949 of zinc output by grades are not available at the time this article is being written. Of interest in this question of grades as an important factor in the supply and requirement demand of consumers is the increasing use of the continuous coating process for galvanizing. The Armco Steel Corp. of Middletown, Ohio, who bought the Sendzimar patents, has recently announced that it has licensed the Inland Steel Co. of Chicago to use its continuous coating process. Armco built the first continuous coating unit in 1936 at its Butler, Pa., plant. Encouraged by the success of the pilot plant, it is stated that Armco has now added three units, investing a total of about $5,000,000 in this process. The United States Steel Corp. also has installed at least five units which it is understood are quite similar.

There has been much experimentation with the grade of zinc used in these continuous galvanizing plants, with a trend, it is said, towards the use of purer and purer zinc. This trend toward the use of pure zinc has been stimulated by the corrosion problem induced by the use of aluminum and the presence of cadmium and lead in the bath, as already thoroughly demonstrated in the case of die-castings and by the superior bending qualities of high grade zinc coatings. There is as yet no standard practice as to the grade of zinc to be employed.

The Certified Zinc Alloy Plan instituted by The American Die Casting Institute in the past year is an additional safeguard that high purity zinc metal will be used in the manufacture of zinc-base alloy die castings thus assuring the resulting proper mechanical and physical properties of these castings. This will further stimulate the growth of an industry which in recent years has become the second largest user of zinc. In this connection it may be noted that the percentage of zinc base die castings increased over aluminum die castings in 1949.

A minor item is the increasing use of zinc sulphate in the manufacture of artificial silk by the Viscose process. It is now well established that a certain amount of zinc sulphate in the spinning bath is essential to good quality of product. Since the spinning bath is kept on the acid side with sulphuric acid, some companies add zinc oxide to the bath; others buy zinc sulphate with one water of crystallization.

Copper

(*Continued from page* 91)

deliveries to come from 1950 production. Much of this business was placed with American producers. To the extent that ECA authorizations call for USA copper, an equal amount is necessarily added to import requirements for domestic use. Large quantities of copper will be required for the continued rehabilitation of European industries and for future consumption. Much progress has been made. As ECA allocations decline, the ability of European countries to produce and to export increasing quantities of goods may be expected to more than compensate and to assure a ready market for larger quantities of copper.

Devaluation of Sterling from $4.03 to $2.80 in September 1949 resulted in at least a temporary benefit to those producers whose costs are measured in Sterling. However, wage adjustments and higher cost of fuel, supplies, transportation and taxes are rapidly reducing the effect of this windfall. The British Ministry of Supply continues to base its purchasing price on the dollar value of copper in New York, with the result of higher prices to British fabricators than those paid by American consumers.

No important new source or increased production is in early prospect. Additional copper from "The Greater Butte" project will not augment the supply until 1952. Magma Copper Co. is continuing development of San Manuel with proven reserves, as estimated by churn drilling, of 462,784,500 tons of 0.782 percent copper ore. Good progress was made in sinking shafts in 1949, but it will be several years before production begins.

Gear Production to Demand

At the end of the year, demand was high in all markets and for all general uses, indicating good volume of business in 1950. Most forecasts are optimistic. This is particularly true with respect to those industries which are the principal consumers of copper. However, there are numerous warning signals calling for constant alertness and study of conditions. A basic raw material industry, with no control over the demand for its product, must be ever ready to adjust production to demand. It should produce to maximum ability when the output is needed, but should avoid accumulation of stocks, which always depress price regardless of cost.

Copper is a world commodity. Its welfare is indissolubly linked with the welfare of all industrial countries, but particularly with American economy. It is an integral part of that economy, which will continue to experience temporary recessions but will press forward with new advances and establish new high records in the future.

Rock dusting at the working faces reduces explosion hazards

Safety in Mining

Record Low Accident Rate Achieved in 1949

By C. M. DONAHUE
Manager, Mining Department
Mine Safety Appliances Co.

SAFETY in mining operations is receiving national acclaim for the reason that in recent years, notably 1948 and 1949, greater progress has been made in the preservation of life and reduction of injuries to workers than ever before.

Although production in the mining industry was curtailed in 1949, mostly by strikes and short work weeks, preliminary statistics indicate that for the tonnage produced, the fatal and non-fatal injury rates are the lowest in the history of mining.

In addition to being complimentary to officials and employes alike, this commendable record presents a challenge to the future to improve upon past performance. At present there is more interest, enthusiasm and "know-how" to achieve greater accomplishments in safety than ever before. That it can be done seems to be a foregone conclusion provided that all facilities at our command are utilized and followed through with the determination that has characterized the mining industry leaders during the past two years.

Educational work among employes by company officials, state, federal and other organizations is showing the desired results, and where planned educational programs have been completed, accidents are definitely on the down grade. Training of supervisory officials and employes in particular phases of work is productive of gratifying results. Mechanized mining makes training courses more desirable now than ever before so that proper handling and maintenance of equipment will be done safely.

Manufacturers are cooperating in producing mining machines that are engineered to increase their safety and utility. New problems are being met and solved with safety as the foremost consideration. That good designs and equipment of high quality are being made available with detailed training programs for crews is verified by the low percentage of the total of injuries and fatalities particularly reported as being caused by machinery.

Roof Support Improvement Cuts Accidents

Falls of roof and face continue to be the leading cause of fatalities with underground haulage contributing substantially to the total of fatalities. Having been recognized as the major cause, prevention of roof-fall accidents is receiving accelerated attention in practically every mining area.

Many companies have adopted roof-bolting procedures while others have other methods of roof support, depending upon the strata, either in effect or in the experimental stages. Roof bolting has been found to be a most desirable method of roof support and has been extensively adopted with satisfactory results. Individual company records show that the frequency and severity of roof-fall injuries have been reduced by roof bolting even though this type of support is not applicable for all mining conditions. Federal and state agencies and company officials continue to explore the possibilities of improvement in roof-bolting practices, including health hazards from drilling operations. With recommended precautions being followed, it seems that this action represents a most remarkable step in the elimination of roof-fall accidents at working faces and also along haulageways and other areas in which men work or travel.

Although there has been a reduction

Well-equipped rescue crews are trained to meet all emergencies

in haulage accidents in 1949 over 1948, this still represents a field where greater improvement can be anticipated as more companies are installing newer motors, cars and accessory equipment such as automatic signals and electronic devices for underground communication.

Education and Training Improve Safety

The exclusion of major disasters from coal mining reports in 1949 makes this an outstanding year in this respect as it is the first calendar year and the longest period in history of coal mining in which there has not been a major disaster, the last reported having occurred on November 4, 1948, when a fan house fire was the cause of five lives being lost by suffocation. The last major mine explosion in a bituminous coal mine was on July 30, 1948. During this period, however, there were several underground fires in coal and metal mines which were so controlled that lives and property were safeguarded. It is known that many lives in fire areas were saved by trained mine officials who guided men, after providing them with respiratory protection, through poisonous gas and smoke. This is a tribute to the men and their training as well as to efficient work on the part of mine rescue crews.

Communications systems reduce haulage accidents

More state mining departments are acquiring mine rescue trucks fully equipped for training and for emergency calls to fires and explosions. These mobile units serve to supplement company-owned mine rescue equipment and are available for training teams in first aid and in the use of oxygen breathing apparatus and in best practices to follow in fighting fires and recovery work.

In their plans to provide increased and more effective ventilation, some companies have sunk auxiliary shafts that can be used as emergency escapeways. With increasing attention to ventilating problems and more general use of permissible equipment, the possibilities of gas ignitions are being lessened. Added precautions of importance include the application of rock dust to within 40 ft of face workings and increased use of permissible explosives and blasting devices.

Statistics from the Pennsylvania Department of Mines show again that progress had been made in safety in anthracite mining as the fatality rate per million man-hours in 1949 is estimated to be .78 as compared to .83 in 1948, making this past year the safest on record. Similarly, the trend has been downward for all bituminous mining in the United States and it is estimated that when final figures are compiled that at least a 10 percent reduction in the fatality rate over 1948 will be evident.

Downward trends in accidents in metal mining are apparent also and although data are not compiled yet for 1949, the progress of individual companies in this field is noteworthy.

With this outstanding record of safety progress in various types of mining, the task of officials and employes becomes increasingly clear—to coordinate all efforts and facilities to make 1950 the safest year ever for all those employed in the mining industry.

PRELIMINARY INJURY DATA ON COAL, METAL, AND NONMETAL MINES, PITS, AND QUARRIES IN THE UNITED STATES, 1948-49

	1949	1948
Bituminous coal mines—		
Number of injuries:		
Fatal	500	870
Nonfatal	29,800	41,715
Rate per million tons:		
Fatal	1.15	1.45
Nonfatal	68.51	69.58
Tons produced	435,000,000	599,518,000
Anthracite mines—		
Number of injuries:		
Fatal	93	140
Nonfatal	8,400	12,330
Rate per million tons:		
Fatal	2.18	2.45
Nonfatal	196.89	215.79
Tons produced	42,664,000	57,140,000
All coal mines—		
Number of injuries:		
Fatal	593	1,010
Nonfatal	38,200	54,045
Rate per million tons:		
Fatal	1.24	1.54
Nonfatal	79.97	82.30
Tons produced	477,664,000	656,658,000
Metal mines and pits—		
Number of injuries:		
Fatal	90	101
Nonfatal	6,800	7,515
Nonmetal mines and quarries—		
Number of injuries:		
Fatal	80	88
Nonfatal	6,100	6,175
All mines, pits, and quarries—		
Number of injuries:		
Fatal	763	1,199
Nonfatal	51,100	67,735

NOTE: Injury rates in metal and nonmetal industries are not yet available.

Changes in Tax Laws Needed to Promote Mining Development

Recommendations of the National Minerals Advisory Council to the Department of the Interior for Revision of Mining Tax Laws to Restore Incentive for Investment, Exploration and Development

IN the letter of transmittal of these important recommendations, Horace M. Albright, Chairman of the National Minerals Advisory Council, said, in part:

"This legislative program is predicated upon the concept that, while national security and the industrial and economic health of the nation rest on many things, an adequate, reliable and available supply of metals and other strategic minerals is basic and fundamental.

". . . because of distinctive features inherent in the mining business, special tax treatment can be rationally applied to it without disturbing or conflicting with the general tax structure; . . . to whatever extent new and profitable enterprises were launched, . . . income tax revenue would be increased.

". . . we are day by day becoming increasingly more dependent on foreign sources for our metal supply. This is not because we are a 'have not' nation, but because economic conditions are unfavorable for the continued search for new, domestic sources of these strategic and critical supplies. . . .

". . . Production of several of our most strategic metals has practically ceased. . . . The search for and development of new reserves of the other metals is lagging far behind a safe minimum of future requirements. The operating mines of the future are dependent upon a long program of continued exploration and development of today."

The exploration and development of nonferrous and strategic metals deposits in the United States by individuals and smaller corporations has declined alarmingly. Work by larger corporations is principally in extending the initial enterprise of many individuals and small units. But even these corporations must consider the effect of their taxes and the taxes on their stockholders in determining whether the risk in new endeavor is worth while.

The members of the National Minerals Advisory Council have been selected by the Secretary of the Interior as representative of the industry and acquainted with its problems. It is their unqualified opinion that excessive taxation is a principal cause of the lack of interest in exploration for and development of new mineral reserves. Reduced tariffs and imports from depreciated currency nations and other conditions have their effect, but our present taxation is such that the individual and the corporation qualified to carry on has little opportunity to recover its investments and still less possibility to realize a profit.

Incentive for mining exploration, development, and operation comes from hope of a gain sufficient to warrant the risk, the effort and the investment involved. If possible gains are too greatly impaired by taxation, or if gains are taxed without full allowance for losses, there can be little incentive for new exploration, development and investment.

The prospect of capital recovery free from tax will not in itself provide incentive. There must be the prospect of gain. But the taxation of capital recovery as if it were income, or the denial or limitation of losses as effective deductions from taxable income greatly increases the risk and can virtually destroy incentive for finding and developing new mines. This is the situation under the tax provisions and high rates of our present laws.

To remedy these conditions, the following changes in the tax structure *as applied to mining* must be made:

(1) Allowance for depletion should be made to the stockholder as well as to the corporation.

Each distribution to stockholders should be considered to represent depletion to the same extent that depletion is allowed against income to the corporation.

(2) Tax exemption should be granted to a mine for a period of at least three years after beginning of profitable operations.

Such an exemption would be most important in stimulating new development and discovery, as it has in Canada.

(3) Development costs after discovery should be recognized as operating expenses.

Such development costs should not be treated as capital expenditures, recoverable through depletion. Their nature and purpose is for operation of and production from the known deposit. The taxpayer should have option to charge them off currently or to treat them as operating costs when the ore related to such expenditures shall be mined.

(4) Adequate allowances for percentage depletion should be made.

The present percentage of gross income and the present limitation in reference to net income for mines should both be increased.

(5) Losses from unprofitable ventures should be allowed corporations, partnerships or individuals as ordinary deduction against current income.

When a mine is abandoned or becomes unprofitable or when exploration or development work has not proven the existence of a profitable mineral deposit, or when a shareholder sustains a loss on liquidation of the corporation, the loss should be allowed in full as a deduction from income.

(6) Income should not be taxed without full allowance for losses of loss years.

A carry-back for two years and a carry-forward of five years should be allowed. Depletion and other deductions and credits should be allowed as if the loss year and the income year were a single taxable period.

The Council recommends that Federal tax laws be modified to include the changes outlined in this report as approved at its meeting of December 7, 1949.

Subcommittee on Taxation

WILBER JUDSON, *Chairman*
K. C. BROWNELL
NEIL W. RICE
S. H. WILLISTON

(A fuller explanation of these and other tax changes needed to promote a vigorous mining industry has been prepared by the American Mining Congress and will be supplied upon request.)

Sales of Mechanical Loading and Cleaning Equipment For Coal Mines in 1949

By W. H. YOUNG and R. L. ANDERSON

Respectively, Chief, Bituminous Coal Section, and Engineer-economist, U. S. Bureau of Mines.

SHIPMENTS of mechanical-loading equipment for underground use in coal mines in the United States, in terms of capacity, were less in 1949 than in any year since 1935. The capacity of mechanical cleaning equipment sold for use at bituminous coal mines was 25 percent less in 1949 than in 1948.

Shuttle car and "mother" conveyor shipments decreased in 1949, 29 and 51 percent, respectively, from 1948.

This survey was made possible by the courteous cooperation of all known manufacturers of mechanical cleaning equipment for bituminous coal and manufacturers of mechanical loading and supplementary haulage equipment for use in all coal mines in the United States. Data from various trade journals were also utilized.

Mechanical loading units and supplementary haulage equipment "sales in 1949" represent shipments made during 1949. About 40 percent of the mechanical cleaning equipment sold in 1949 was put in operation during the year; the balance will be installed in 1950.

Mechanical Loading

Bituminous coal and lignite mechanically loaded in underground mines decreased from 298,157,281 tons in 1947 to 295,806,285 tons in 1948 or 0.8 percent. Mechanical loading in Pennsylvania anthracite mines dropped from 16,054,011 tons in 1947 to 15,742,368 in 1948 or 1.9 percent.

Table I shows data on bituminous coal and lignite production by methods of mining and mechanical cleaning for 1947-49, inclusive. Due to strikes, diminished demand, and the three-day work-week, which was in effect during most of the last half of 1949, production in 1949 amounted to only 435,000,000 tons. Although the total production decreased in 1949 from 1948, the percentage mechanically loaded and mechanically cleaned

TABLE I

BITUMINOUS COAL AND LIGNITE PRODUCTION, BY METHODS OF MINING AND MECHANICAL CLEANING, IN THE UNITED STATES, 1947-49, INCLUSIVE

	1947		1948		1949*	
	Thousands of net tons	% of total	Thousands of net tons	% of total	Thousands of net tons	% of total
Surface stripping	139,395	22.1	139,506	23.3	99,000	22.8
Hand-loaded underground	193,072	30.6	164,206	27.4	110,000	25.3
Mechanically loaded underground	298,157	47.3	295,806	49.3	226,000	51.9
Total production	630,624	100.0	599,518	100.0	435,000	100.0
Mechanically cleaned	174,436	27.7	180,880	30.2	137,000	31.5

* Preliminary

TABLE II

UNDERGROUND BITUMINOUS COAL AND LIGNITE PRODUCTION, BY METHODS OF LOADING, 1947-49, INCLUSIVE

	1947		1948		1949[1]	
	Thousands of net tons	% of total	Thousands of net tons	% of total	Thousands of net tons	% of total
Loaded by machines[2]	252,611	51.4	253,044	55.0	[3]	[3]
Handled by conveyors[4]	45,546	9.3	42,762	9.3	[3]	[3]
Total mechanically loaded	298,157	60.7	295,806	64.3	226,000	67.3
Hand loaded	193,072	39.3	164,206	35.7	110,000	32.7
Total underground production	491,229	100.0	460,012	100.0	336,000	100.0

[1] Preliminary
[2] Includes mobile loaders, continuous miners, scrapers, and conveyors equipped with duckbills or other self-loading heads
[3] Included under "Total mechanically loaded"
[4] Includes hand-loaded conveyors and pit-car loaders

each increased in 1949 over 1948. Underground production of bituminous coal and lignite, by methods of loading is shown in Table II. The preliminary figures for 1949 show that 67.3 percent of the underground output was loaded mechanically and the balance or 32.7 percent was hand loaded into mine cars.

Types of units sold—Table III lists the units of mechanical loading equipment shipped to bituminous coal, anthracite, and lignite mines for underground use in the United States, 1942-49, inclusive. Each type of equipment showed a large decrease in 1949 sales from the previous year. Sales of mobile loaders in the United States were less in 1949 than in any other year since 1943 and it is necessary to go back to a depression year (1933) to find conveyor sales below that of 1949.

Exports of underground mechanical loading equipment in 1949, in terms of capacity, amounted to 38 percent of the shipments made to mines in the United States. This is in comparison with 9 percent in 1948.

Types of mechanical loading equipment sold compared with units in use—The trend in demand for various types of mechanical loading equipment is shown in Table IV. Mobile loaders, self-loading conveyors, and hand-loaded conveyors have increased substantially in number from 1942 to 1948, while scrapers and pit-car loaders have declined at bituminous coal and lignite mines.

The total number of mechanical loading units of all types at Pennsyl-

—*William Vandivert*

Coal cleaning equipment sold in 1949 had a total capacity of 13,300 net tons per hour

TABLE III

UNITS OF MECHANICAL LOADING EQUIPMENT SOLD TO BITUMINOUS COAL, ANTHRACITE AND LIGNITE MINES FOR UNDERGROUND USE, AS REPORTED BY MANUFACTURERS, 1942-49, INCLUSIVE

	1942	1943	1944	1945	1946	1947	1948	1949	Change 1949 from 1948 percent
Type of equipment:									
Mobile loaders	352	234	286	359	495	486	[1]725	[1]286	—60.6
Scrapers[2]	29	15	39	26	35	35	49	18	—63.3
Conveyors[3]	1,491	1,100	708	861	1,157	987	1,209	541	—55.3
Pit-car loaders	2	1	...	[4]	[4]	[4]	[4]	[4]	....
Total all types	1,874	1,350	1,033	1,246	1,687	1,508	1,983	845	—57.4
Number of manufacturers reporting	28	24	22	25	24	23	22	22	....

[1] Includes continuous miners
[2] Reported as scrapers or scraper haulers and hoists
[3] Includes hand-loaded conveyors and those equipped with duckbills or other self-loading heads
[4] Canvass of sales of pit-car loaders discontinued in 1945

TABLE IV—SALES OF MECHANICAL-LOADING EQUIPMENT IN 1949 COMPARED WITH TOTAL NUMBER OF MACHINES IN ACTIVE USE IN PRECEDING YEARS

	Number of machines in active use, as reported by mine operators							Number of machines sold, as reported by manufacturers in 1949
	1942	1943	1944	1945	1946	1947	1948	
Bituminous-coal and lignite mines:								
Mobile loading machines	2,301	2,525	2,737	2,950	3,200	3,569	[3]3,980	[3]286
Scrapers	93	83	87	87	75	67	56	8
Pit-car loaders	481	321	241	142	93	71	37	([2])
Conveyors equipped with duckbills or other self-loading heads	1,062	1,226	1,331	1,383	1,521	1,531	1,632	([3])
Hand-loaded conveyors, number of units	3,041	3,191	3,236	3,385	3,470	3,979	4,125	394
Anthracite mines (Pennsylvania):								
Mobile loading machines	([4])	5	12	20	27	25	19	....
Scrapers	[4]524	510	491	548	564	594	643	10
Pit-car loaders	([5])	([5])	([5])	([5])	([5])	([5])	([5])	([5])
Conveyors equipped with duckbills or other self-loading heads	([5])	([5])	([5])	([5])	([5])	([5])	([5])	([5])
Hand-loaded conveyors, number of units	[5]2,491	[5]2,701	[5]2,807	[5]3,006	[5]3,233	[5]3,457	[5]3,562	147

[1] Includes continuous miners
[2] Canvass of sales of pit-car loaders discontinued in 1945
[3] Sales of conveyors equipped with duckbills or other self-loading heads are included with hand-loaded conveyors
[4] Mobile loading machines are included with scrapers
[5] Pit-car loaders and conveyors equipped with duckbills or other self-loading heads are included with hand-loaded conveyors.

TABLE V—COMPARISON OF MECHANICAL LOADING EQUIPMENT IN ACTUAL USE IN 1948 WITH SALES REPORTED IN 1949

	Mobile loaders[1]		Scrapers		Conveyors[2]	
	In use in 1948	Sales in 1949	In use in 1948	Sales in 1949	In use in 1948	Sales in 1949
Bituminous coal and lignite mines						
Alabama	143	22	29	...	416	16
Arkansas	1	1	...	...	74	7
Colorado	32	7	...	2	326	6
Idaho	...	...	...	...	...	1
Illinois	565	23	...	1	18	13
Indiana	163	14	...	...	...	...
Iowa	7	...	...	...	7	...
Kansas	...	...	...	...	...	1
Kentucky	422	36	...	...	726	38
Maryland	1	...	...	...	38	...
Missouri	...	...	...	...	...	2
Montana	35	...	...	...	8	3
Nebraska	...	...	...	...	...	1
New Mexico	19	...	2	...	1	1
North Dakota	7	1	...	...	...	1
Ohio	195	12	...	...	178	3
Oklahoma	4	...	...	...	61	1
Pennsylvania	928	57	7	...	969	72
Tennessee	26	1	...	...	208	9
Utah	91	11	1	...	119	15
Virginia	115	8	...	...	197	8
Washington	...	...	9	...	92	...
West Virginia	1,197	92	...	5	2,017	193
Wyoming	29	1	8	...	302	3
Total bituminous coal and lignite	3,980	286	56	8	5,757	394
Pennsylvania anthracite mines.	19	...	643	10	3,562[3]	147
Grand total	3,999	286	699	18	...	541

[1] Includes continuous miners
[2] Includes hand-loaded conveyors and conveyors equipped with duckbills or other self-loading heads
[3] Includes pit-car loaders and duckbills or other self-loading conveyors

TABLE VI—NUMBER OF MOBILE LOADERS IN USE IN BITUMINOUS COAL AND LIGNITE MINES, BY TYPES OF LOADING IN EACH STATE, 1947 AND 1948

State	Number of mobile loaders[1]							
	Loading direct into mine cars		Loading onto conveyors		Loading into shuttle cars		Total number in use	
	1947	1948	1947	1948	1947	1948	1947	1948
Alabama	28	31	65	63	42	49	135	143
Arkansas	...	1	...	...	...	...	...	1
Colorado	12	16	2	...	14	16	28	32
Illinois	416	380	27	27	111	158	554	565
Indiana	103	111	...	...	39	52	142	163
Iowa	2	2	3	5	...	...	5	7
Kentucky	173	207	14	22	164	193	351	422
Maryland	...	...	...	...	3	1	3	1
Montana (bit. and lig.)	36	31	...	...	5	4	41	35
New Mexico	13	13	...	...	5	6	18	19
North Dakota (lignite)	7	7	...	...	...	...	7	7
Ohio	119	114	20	23	40	58	179	195
Oklahoma	...	...	4	4	...	...	4	4
Pennsylvania (bitumin's)	556	612	67	84	177	232	800	928
Tennessee	3	6	...	1	12	19	15	26
Utah	58	48	9	8	20	35	87	91
Virginia	76	84	3	4	19	27	98	115
Washington	1	...	...	...	...	...	1	...
West Virginia	772	791	47	74	252	332	1,071	1,197
Wyoming	22	25	4	...	4	4	30	29
Totals	2,397	2,479	265	315	907	1,186	3,569	3.980

[1] Figures for 1948 include continuous miners

vania anthracite mines increased from 3015 in 1942 to 4224 in 1948 or 40 percent, compared with a 41-percent increase at bituminous coal and lignite mines in the same period.

Types of equipment purchased by states—Table V shows the number of mobile loaders, scrapers and conveyor units shipped into various states in 1949 and the number in use in 1948. West Virginia received the greatest number of mobile loaders and conveyors shipped in 1949, followed by Pennsylvania and Kentucky.

Haulage Equipment

Shutte cars—Total sales of shuttle cars for use in coal mines in the United States from our record of first sales in 1936 through 1949 was 3392. Approximately 3000 of these shuttle cars are in use at the present time.

Sales of loading and conveying equipment fell as strikes cut coal output

Table VI shows the number of mobile loaders in bituminous coal and lignite mines by states and types of loading in 1947 and 1948. The total number of mobile loaders in use increased from 3569 in 1947 to 3980 in 1948 or 12 percent, while the number loading into shuttle cars rose from 907 to 1186 or 31 percent. During 1948, 33 percent of the total tonnage of bituminous coal and lignite loaded by mobile loaders was handled by shuttle cars. The remainder of the mobile loader tonnage was loaded onto conveyors (5 percent) or direct into mine cars (62 percent).

Sales of shuttle cars are listed by states for the first time. Table VII shows total sales for the years 1936-48, inclusive, and 1949. West Virginia has received the greatest number or 30 percent of the total sales. Pennsylvania, Kentucky, Illinois and Alabama followed in the order named.

"Mother" conveyors—For the purpose of this study, a "mother" conveyor is defined as a sectional, extensible power-driven conveying unit that can handle over 500 ft of conveyor. Main slope conveyors are excluded. The last three columns in Table VII shows the sales of "mother" conveyors by states for the years 1947, 1948 and 1949.

TABLE VII

SALES OF SHUTTLE CARS 1936-48, INCLUSIVE, AND 1949 AND "MOTHER" CONVEYORS 1947-1949, FOR USE IN COAL MINES, BY STATES

State	Shuttle cars 1936-48 inclusive	Shuttle cars 1949	"Mother" conveyors 1947	"Mother" conveyors 1948	"Mother" conveyors 1949
Bituminous coal and lignite mines:					
Alabama	181	35	5	6	...
Arkansas	...	...	1	...	...
Arizona	...	...	...	1	...
Colorado	41	10	1	...	3
Illinois	290	76	6	14	8
Indiana	125	22	8	...	4
Iowa	...	...	1	...	...
Kentucky	518	61	31	41	16
Missouri	...	1	...	...	...
Montana	2	...	...	...	...
New Mexico	13	...	...	...	...
North Carolina	...	...	...	...	1
North Dakota	9	...	...	...	...
Ohio	127	15	23	5	3
Oklahoma	...	...	...	5	3
Pennsylvania	483	143	26	25	13
Tennessee	69	2	5	3	...
Utah	55	15	...	...	2
Virginia	70	5	3	4	3
West Virginia	850	155	90	124	59
Wyoming	14	3	...	2	1
Total bituminous coal and lignite	2,847	543	200	230	116
Pennsylvania anthracite mines	2	...	4	5	...
Grand total	2,849	543	204	235	116

Mechanical Cleaning

Reports from 18 manufacturers of bituminous coal-cleaning equipment show that the total capacity of 1949 sales was 13,300 net tons of clean coal per hour, compared with 17,700-ton capacity sold in 1948, a decrease of 25 percent. Sales were made in 15 states. Two states received almost half of the total capacity of the 1949 sales, West Virginia 28 percent, and Pennsylvania 20 percent. Illinois, Ohio, Kentucky and Indiana followed in the order named.

Table VIII gives data on bituminous coal cleaned in 1948 by type of equipment in use and also the annual capacity of equipment sold in 1949. Sales in 1949, by type of equipment, show that jigs hold first place, with dense-media and launders following.

For comparative purposes, annual capacity of 1949 sales is based on the average number of days (217) bituminous coal mines were active in 1948. The capacity of all types of equipment sold in 1949 for cleaning bituminous coal by wet methods, was equivalent to 11.2 percent of the bituminous coal cleaned in 1948, while the capacity of pneumatic equipment sold in 1949 was 9.9 percent of the tonnage pneumatically cleaned in 1948.

The ratio of 1949 sales of new cleaning plants to additions or replacements of present plants, in terms of capacity, was 35 percent new plants and 65 percent additions or replacements.

TABLE VIII

BITUMINOUS COAL CLEANED IN 1948 AND CAPACITY OF EQUIPMENT SOLD IN 1949, BY TYPES OF EQUIPMENT[1]

Type of equipment	1948: Number of plants in operation[2]	1948: Net tons of cleaned coal[2]	1948: Percent cleaned by each type	Annual capacity of equipment sold in 1949[3] (net tons)
Wet methods:				
Jigs	249	87,506,353	48.4	[4]
Concentrating tables	11	4,359,859	2.4	[4]
Classifiers	74	18,304,622	10.1	[4]
Launders	18	16,787,899	9.3	[4]
Dense-media	86	20,637,635	11.4	[4]
Jigs and concentrating tables	15	5,252,035	2.9	[4]
Other combinations of above methods	29	11,816,119	6.5	[4]
Total wet methods	482	164,664,522	91.0	18,500,000
Pnuematic methods	84	16,215,801	9.0	1,600,000
Grand total	566[5]	180,880,323	100.0	20,100,000

[1] A small percentage of the equipment sold in 1949 was placed in operation during the year and the remainder will be placed in operation during 1950 and 1951

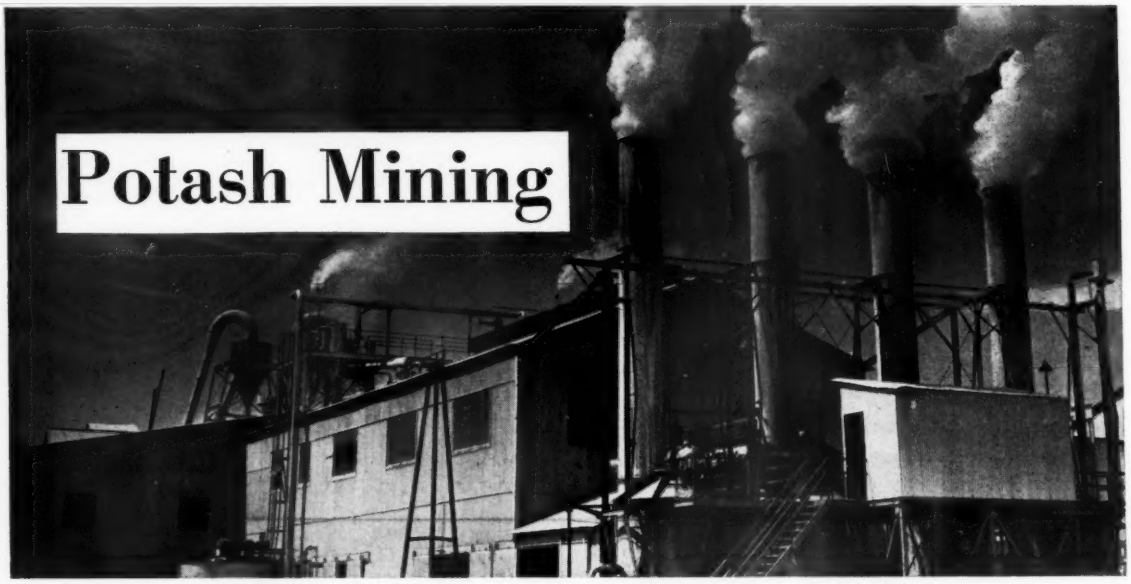
[2] Includes plants operated by consumers at central washeries in Colorado and Pennsylvania

[3] Based on 217 days (average days mines were active in 1948) and 7.0 hours per day

[4] Included under "Total wet methods"

[5] Includes a duplication of 64 plants using both wet and pneumatic methods; deducting this duplication gives a net total of 502 plants that cleaned coal in 1948

Potash Mining



International Minerals & Chemical Corp. expanded its chemical plant in 1949

A Year of Plant Expansion and Changing Market Conditions

By TOM WARE
Chief Engineer
International Minerals & Chemical Corporation

DURING the past year there has been a broad expansion of plant facilities in the potash mining industry. Foreign potash producers have been busy rebuilding, modernizing and expanding their production facilities. Domestic producers, on the other hand, even though still in a period of strong demand, have been sensing a return to keener competitive conditions ahead for the industry on the short range future view; they have been expanding their plants primarily with an eye to new products as well as improved plant capacity. Aside from the foregoing short range future domestic situation, however, there was considerable activity in exploration and leasing that foreshadows an increased domestic supply of potash in years to come. Improved mining and plant equipment and operational techniques also headline the year's developments in the industry.

Foreign Situation

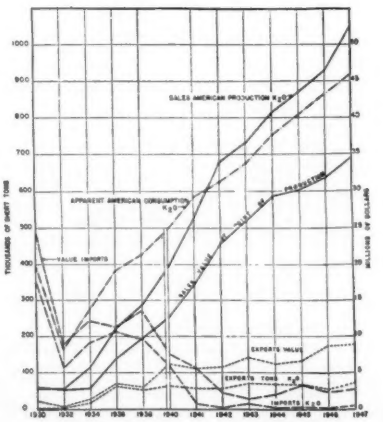
Due to the still confused pattern of European business conditions, unfortunately it is not possible to define any more clearly the present rates of potash production abroad than it was possible last year. From a prewar production rate of 581,800 metric tons K_2O per year, however, French potash production is now known to have increased to a rate in excess of 700,000 metric tons K_2O per year. Germany's Western zone is reported to have increased its production substantially over the 431,000 metric tons estimated for 1948. Spain is also understood to have increased her potash production for the past year's operations. Foreign production data as recently reported this fall by various governments through the F.A.O. of the United Nations shows the remarkably strong potash production increase for all producing areas.

Future world potash market conditions have been seriously clouded, however, by the iron curtain which runs through the large potash producing area of Germany. The present Soviet zone of Germany, before the war, supplied practically 60 percent of the world potash trade. Latest information received from the Russian zones of Germany indicates that these potash mines have not as yet reached their prewar capacities. Tales of eastern sector desertions, high-grading, and general operating confusion are received, but no factual information has been obtained that could be used to evaluate tonnages produced in this formerly heavy potash-producing zone.

French Plants Modernizing, Expanding

At the French potash mines the large dollar support from ECA funds has made it possible for the French potash to make substantial market gains. The French are reported to have gone all out in a three-pronged offensive: To finish rebuilding war-damaged facilities; to modernize mining and processing facilities; and to continue expansion of their plants.

Recent reporting on the French potash operations shows that these mines have been buying much U. S. perfected mining equipment. It is understood that the French mines have been employing jumbos, and are turning to trackless mining components of underground mining equipment such as that which had been developed in the Carlsbad area. The French are also reported to be developing a continuous type mining machine for use in potash; it embodies a disc principle and is to operate on the long wall.



Apparent trends in American potash production and imports. From Industrial Minerals & Rocks

Although the French had been mining potash for several generations before potash was found and processed in the U. S. A., it is interesting to note that they are now turning to the use of amines. The French are reported to be making every effort to improve on both production and grade of potash salts.

World Markets Changing

In a survey made early last year by the Chemical Products Committee (Organization for European Economic Cooperation) in its interim report on the European Recovery Program, the present consumption demand was reported to be well ahead of production. The chemical committee, further anticipated, however, that the potash production will be catching up from 1950-1951, so that soon exportable surpluses of potash are expected to become evident. The approaching marketing period of the next year for potash has been conceded, therefore, to bring a year of changing world market conditions.

Probably the keenest indicator of a return to competitive marketing of potash in this country is evident on the Atlantic seaboard. This has always been a natural market for foreign shipments, and more particularly with today's ever rising freight costs which make it more difficult for domestic producers who must ship at least 1900 miles by rail. The recent devaluation of the French franc in relation to the dollar has also aided the French in the Atlantic seaboard market. As a consequence, French muriate is now being quoted at 65¢ per unit K_2O ex-vessel, only a few cents above domestic prices, so that this market is now considered essentially competitive. If one considers the dollar need of foreign potash producing countries, a return to much stronger competitive conditions is also to be expected.

Approximately 26,000 tons of 60 percent French potash have been sold in the U. S. during the past year. Substantial quantities of French potash are also reported to have been taken by Canada, the delivery into Canada involving the exportation of certain tonnages of nitrogenous products to France. A recent shipment to this country of 3500 tons of German potash has also been reported.

POTASH PRODUCTION FOR 1938 AND YEARS ENDING 30 JUNE, 1947, 1948 AND 1949 (FROM SEPTEMBER 1949, REPORT OF F. A. O. OF UNITED NATIONS)

	Metric tons K_2O			
Country	1938	1946/47	1947/48	1948/49 Preliminary
Europe:				
France	581,800	596,000	659,000	665,000
Germany—All zones	1,861,000	(750,000)	(1,020,000)	(1,280,000)
Western zones	(711,000)	278,650	431,400	590,000
Soviet zone	(1,150,000)	(471,350)	(588,600)	(690,000)
Spain	(25,500) *a*	165,000	216,000	230,000
Total	2,468,300	1,511,000	1,895,000	2,175,000
North and Central America:				
United States	287,500	813,000	866,000	962,000
South America:				
Chile	(10,000)	10,170	10,660	11,220
Asia:				
Israel	(29,100)	40,000	29,700 *b*	.....
Japan	(4,400)	970 *c*	1,440 *c*	2,080 *c*
Total	(33,500)	40,970	31,140	2,080
Africa:				
Union of South Africa	.....	250 *d*	250 *d*	200 *d*
Oceania:				
Australia	.....	1,800	1,100	1,100
WORLD TOTAL	2,799,300	2,377,190	2,804,150	3,151,600

Source: Estimates presented by governments. Figures in parentheses are estimates subject to confirmation.

a 1939.

b To April 1948, when work was discontinued and was not resumed by July 1949

c Bittern and feldspar

d Manure salts from molasses residue

New Developments at Carlsbad

By JAMES A. BARR
Consulting Engineer
Mt. Pleasant, Tenn.

THERE was increased activity in exploration and leasing of potash lands in a "T" shaped area of about 1600 sq miles surrounding the three operating companies' holdings. Of this area, about 20 sq miles of more or less interesting ore bodies have been outlined or indicated. The Freeport Sulphur Co. acquired control of the Cross interests and leases or permits. The latter interests have been conducting solution-type mining tests but have discontinued the work with no commercial results reported. The Duval Texas Sulphur Co. has been the most active and has conducted extensive drillings in both the southern and northern part of the field.

Sulphate ores were found in the southern area and an excellent body of sylvinite has been outlined in the northern area between the United States Potash Co. and the Potash Company of America. Tentative plans have been reported for sinking a shaft in 1950, to be followed by a flotation mill with a capacity of 750 tons per day of 60 percent muriate.

The American Metals Co., through their subsidiary, the Southwestern Potash Co., has outlined some good grade sylvinite to the north of the Potash Company of America. Water rights have been acquired and there has been talk of sinking a shaft.

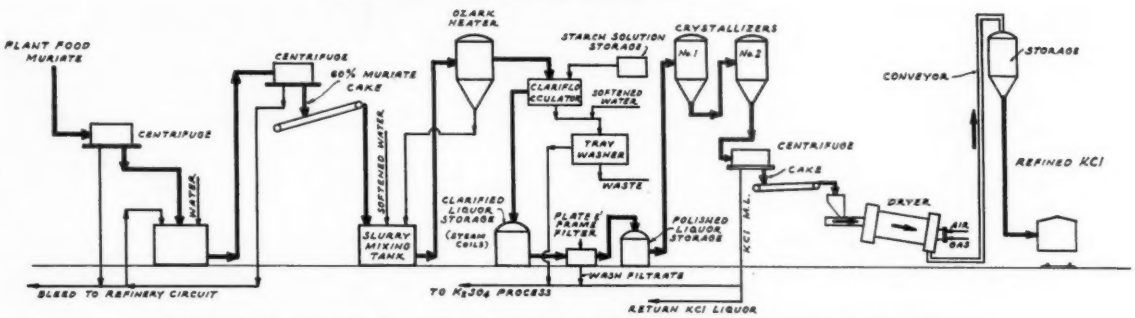
The Central Farmers Fertilizer Co., a co-op, has done some drilling in the southern part of the field, with little of interest reported.

There are approximately 195 sq miles of state land under lease. Government lands under permits or leases cover much of the balance of the area.

All of the operating companies have continued active programs of improvement and capacity increases. The latter has apparently reached a peak for the time being. Except for nominal improvements, any further production capacity increase of consequence in the near future will be if and when the new companies entering the field go through with their plans.

PCA's New Developments

The Potash Company of America has started research on its own design of a continuous type miner said to embody a rotative element principle. The underground conveyor-belt installation reported last year is operating successfully after strengthening one



Schematic flow sheet of International Minerals & Chemical Corp.'s new refined KCl process

section to handle the large lumps direct from the face. Better fragmentation in shooting helped, but enough of the larger lumps remained to give trouble at first. A new Nordberg hoist handling eight-ton skips, installed as a part of the expansion program, is now in operation and on a fully automatic cycle.

Plans have been completed for constructing a new potassium-sulphate plant at the mine site, using sulphuric acid and sylvite concentrate to produce potassium sulphate and hydrochloric acid. The latter is used by the oil companies for acidizing wells.

New Crystallizer for USP

The United States Potash Co. has added a crystal refining unit at its Loving plant, with sufficient capacity to take care of the tonnage of direct shipping grade ore. This grade is not in such active demand.

Low head mining equipment has been ordered, i. e., Joy 14-BU loaders and 36-in. shuttle cars, reported as being for Bed No. 2, a narrow high grade sylvinite seam about 130 ft above Bed No. 4, the main mining seam for sylvinite.

IM&CC Completed Extensive Expansion Program

International Minerals & Chemical Corp. has completed a rather extensive program for the year which included a crystallizing unit for the production of technical grade potassium chloride of exceptionally high purity. This plant is now in production. The equipment includes agitators, Ozark evaporators, heaters, vacuum crystallizers, Bird centrifuges and a rotary dryer. Plant feed is 60 percent grade sylvite concentrate, which is pulped, clarified and put through the flow sheet indicated above. The mother liquor goes to the base exchange plant where potassium sulphate is produced by base exchange of sylvite and langbeinite, i.e., KCl and K_2SO_4. $2MgSO_4$, forming the more insoluble potassium sulphate with an end liquor containing magnesium chloride. The mother liquors from base exchange are evaporated for a return of mixed salts to the base exchange circuit, with the $MgCl_2$ reject noted above.

Other improvements on the surface include replacement of vacuum filters handling flotation concentrate by Bird continuous centrifuges that deliver a lower moisture feed to gas-fired rotary dryers. The dryers have automatic control with temperature of the stack gases regulating the volume of gas to the burners. Another novel dryer feature is water-cooled feed chutes that cut down maintenance materially.

International is now installing a 400-kva automatic starting and running Diesel generator set with a special sectionalized switching arrangement. If the power supply fails, the new Nordberg Diesel unit will start and automatically carry an essential load such as thickeners and the like and supply emergency lighting. Without this new auxiliary power equipment, failure of local power-line service may result in the thickeners otherwise choking up, and it may take from four to five hours to clear this up before operations can be resumed. This will permit the company's present main Diesel power plant to be shut down. In the future, all power is to be supplied by the Southwestern Public Service Co.

There have been no changes of consequence during the last year in underground mining methods. There has been gradual improvement all along the line so that, with such complete mechanization, up to 34 tons mined per man underground per day is usual. Work continued with drill jumbos and larger shuttle cars, reported last year. Diesel haulage is under active consideration and some Diesel equipment such as bulldozers are in use underground. Probably a Diesel-electric shuttle car will be next.

"Indicator" pillar shows crushing as roof flows in an area where 98 percent of support has been removed

IM&CC Tries Pillar Robbing

International Minerals & Chemical Corp. is trying out the effect of pillar robbing in bed No. 4, i.e., the 900-ft level, in a mined-out panel, approximately 1200 ft square. The roof is gradually flowing in, not breaking. Small "indicator" pillars develop a typical "hour-glass" effect in test sections under compression. Additional adjoining panels are to be further, progressively robbed.

Permian Basin Geology

Ordinarily this subject would not be included in an annual review but Mr. G. T. Harley has tentatively advanced a theory to account for the formation

(*Continued on page* 122)

The Strategic Metals Industry

An Obituary Notice on a Vital Segment of Domestic Mining

Five strategic metals essential for industry in peace time and doubly essential in wartime are normally produced in considerable amounts within the United States. As a result of tariff reductions, international monetary devaluation, ECA operations and general governmental apathy, production of these metals has to all intents and purposes ceased. All of these metals must now be obtained from transatlantic or transpacific sources. Let us hope that our Navy's antisubmarine weapons are adequate to permit importation in time of war, for without these five metals it is doubtful if we could win a war with any first-class power.

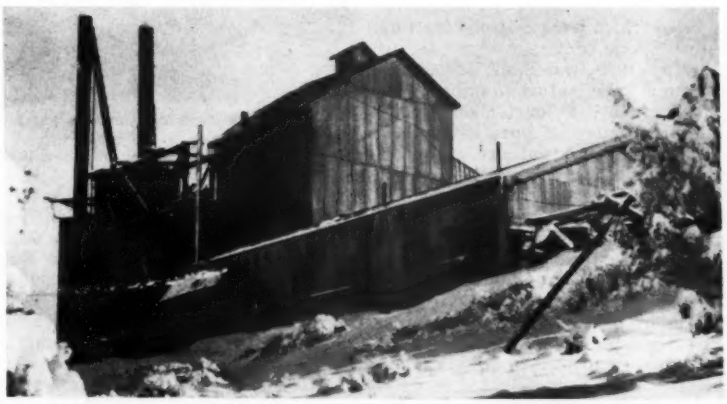
CHROMIUM— Domestic production of chromium within the United States has virtually ceased. Over 99½ percent of the metal consumed in the United States is imported from Turkey, South Africa and the Philippines, with some smaller amounts from Cuba. Imports during 1949 were ample to supply domestic industry, with sufficient excess to take care of Munitions Board requirements. No chrome properties are in standby condition and no major chrome deposits can be made available on short notice.

MERCURY—Mercury production during 1949 was considerably less than 10,000 flasks. Whether it was the lowest level of production in the last 100 years will require compilation of the final figures, but there is little doubt that 1950's production will be even lower. Three major producers worked more or less intermittently during 1949. After the middle of 1950 it is doubtful if domestic production will be as much as 50 flasks a month; 1/10th of one percent of the war-time peak, and less than five percent of prewar production. Future supplies of mercury for American industry will have to come from Yugoslavia, Italy and Spain. Probably not more than one mine will be kept in anything approximating standby condition and all the other deposits will be abandoned to water and caving ground. Over 75,000 flasks of Italian quicksilver filled Government stockpiles with foreign producers' metal.

ANTIMONY—Antimony production within the United States ceased on April 1 of 1949 and as the year closed surplus stocks within this country were still sufficient to depress the market. Domestic production was off 75 percent from 1948 while consumption declined drastically as industry reduced its inventories. The principal domestic producer of antimony is maintaining the property in standby condition. In the meantime, imports from China, Mexico, Yugoslavia, Italy, Bolivia and other European and South American countries continue to depress the market. If the price decline continues, American industry will be entirely dependent upon Communist China, Bolivia and Mexico for the bulk of its future requirements of antimony. Imports were more than enough to take care of industrial needs and provide sources for Government stockpiling.

TUNGSTEN—The market price for tungsten as the year closed was below the cost of production for any domestic mine. Large imports from China, together with metal from South American sources depressed the market to such a point that no domestic property could show a profit. As a result, domestic production in the latter part of the year was not over half the output of the early months of 1949. Although during the war the United States' mines supplied almost 50 percent of our wartime requirements, they are now in such a position that not even a 25 percent increase in the world market price would allow most of them to break even. Although the United States has in the last few years been the second largest producing country in the world, at present prices American industry must rely primarily for tungsten on Communist China with smaller amounts to be expected from some of the South American countries. In the meantime ECA is planning the financing of tungsten production from the Russian boundary of Korea.

MANGANESE—The manganese situation in the United States remained tight in 1949. Intermittent and greatly curtailed shipments from Russia left barely enough imported ore for industry, with little or none available for stockpiling purposes. No new domestic manganese operations entered the producing state although one may start operating in early 1950. It is expected that 90 percent of the steel industrial requirements for manganese will have to be imported from South Africa, the Philippines, India and possibly Brazil, as it did in 1949. Where any surplus manganese for stockpiling will come from is a little difficult to foresee.



Once an important producer of mercury, the Horse Heaven mine is now closed, caved and abandoned

The Silver Situation

Domestic Output Dipped—Mexican and Canadian Production Rose

By HON. PAT McCARRAN
U. S. Senator from Nevada

STABILITY of the price of foreign silver featured the New York bullion market in 1949 to a greater extent than in 1948. A reasonably stable market has prevailed for more than two years. Price changes were noted on only seven occasions in 1949, and all of these showed increases—an unusual occurrence. The year began with the price at 70¼¢ per fine ounce and at intervals of about six weeks to two months the price rose slowly until a high for the year of 73½¢ was attained on September 7. This is a spread of 3¼¢ as compared to a range of 7½¢ in 1948. The market price remained unchanged from the latter date throughout the balance of the year.

The Bank of Mexico has taken it upon itself, as a matter of economic necessity, to stabilize a market heretofore highly sensitive to the whims of silverware manufacturers and bullion brokers. The Bank is in a position to prevent supply from exceeding demand to the end that the price is not affected adversely.

Although the Bank of Mexico made substantial purchases of silver in the first nine months of 1949, a sharp reduction in its stocks was noted near the end of the year because offsetting sales, largely for coinage purposes, were greater than accumulations. Increased coinage orders from other countries was an important factor in contributing to the high volume of sales in 1949 by the Bank. Mexico itself consumed less than a 1,000,000 oz in domestic coinage in 1949. Coins struck in Mexico for Saudi Arabia and China consumed about 46,000,000 oz last year. Also 5,000,000 oz were consumed in the minting of the old .9027-fine pesos which were destined for Far Eastern specie centers.

In May 1949, the Bank of Mexico announced its intention to mint a circular disc called a "barter coin" containing one ounce of pure silver .925 fine. The Mexican authorities hoped this coin might serve as a medium of exchange in world trade as did the old Mexican silver dollar in the nineteenth century. The value of the disc was to be that of the world price of silver at the time, about 72¢ per ounce. Supporters of the plan concentrated on Far Eastern centers where silver coins have always been popular.

However, response in China was not as favorable as anticipated, largely because of the confused situation in Chinese financial centers caused by the civil war. The Chinese silver dollar proved to be preferable to the new Mexican barter coin.

There was little change in the silver situation in Canada mainly because of the maintenance of exchange controls throughout 1949. The Canadian dollar, formerly at par with the United States dollar, was devalued by 10 percent in September. This resulted in a 10 percent increase in the price of silver in terms of Canadian money over the New York price. Otherwise the price in Canada continued to follow the New York quotation.

The London official price for silver followed closely New York quotations during 1949. On September 19, before devaluation, the price ranged from a low of 42½d per ounce to a high of 44½d per ounce. The price jumped the next day to 64d, which was in line with the New York price based on the new rate of $2.80 for the pound. Some silver stocks withheld previously were promptly dumped on the market immediately following devaluation. This activity depressed the price below the New York parity for a short time, but recovery to the 64d level was soon attained. Official silver stocks of the Bank of England were made available at this price.

Mexico's one-ounce silver barter piece carries no marked value

British import and export restrictions remained unchanged during 1949.

Such information as has been available indicates that authorities in England had extracted some 27,000,000 oz of silver during the past three years from coins recalled from circulation in the fall of 1946. This is about 12 percent of the total silver coins in circulation at that time. The opinion has been expressed that the British estimate an additional 22,000,000 oz will be recovered in 1950. No doubt, the British authorities are attempting to cover up the dismal failure of this program.

The only silver known to have been legally imported into India in 1949 amounted to 2,500,000 oz in the form of silver nitrate. The price in Bombay fluctuated between 179 and 189 rupees per 100 tolas ($1.44-$1.52 per ounce) in the first three months of 1949. The lowest point before devaluation was reached on April 11 when the price stood at 171 rupees per 100 tolas ($1.38 per ounce). This situation slowly improved, and on June 15 the price stood at 194 rupees ($1.56 per ounce). On July 5, the Reserve Bank of India commenced selling 200,000-400,000 oz of silver per day. By the end of July the price had dropped to 164 rupees ($1.31 per ounce). After devaluation of the rupee along with the pound on September 19, there was no noticeable adjustment in the price of silver, although the United States equivalent became about 93¢ per ounce after this date. This was due largely to the fact that the Bombay market was almost entirely isolated. However, for the last three months of 1949, the price firmed up at the 170 rupee level

(94.3¢ per ounce at the lower exchange rate). The Reserve Bank of India with reputed stocks of 80,000,000 oz of silver is in a position to swamp the market at any time, as it did in July. It is estimated that 60,000,000 oz of the Bank's holdings came from the seigniorage fund of the United States Treasury under lend lease during the war. This silver is held over the Bombay market as a threat to a higher price. This is a disgraceful situation.

It is indeed a calamity that the Communists have taken the mainland of China. Whatever the outcome, one thing is certain: If the Communists make the mistake that the Nationalists made in 1935—that of abandoning the use of silver as money and circulating paper in its stead—to that extent the Communists will sow the seeds of their own destruction.

In the summer of 1949, the demand for silver in the Honk Kong market jumped, in a short time, from 410 to 475 Hong Kong dollars per 100 taels or from about $1 to $1.20 per ounce before devaluation. Since devaluation the Hong Kong price of silver has increased moderately.

Devaluation

The most important financial development of 1949 was the devaluation of the British pound on September 19. All sterling area countries and many others soon followed. It is doubtful that such action will help these nations to achieve and maintain equilibrium in their balance of payments.

What about the effects of devaluation on silver? It may seem at first glance that the encouragement given to exporters of silver in countries that have devalued their currencies would result in swamping the New York market with silver, thereby depressing the price. It must be remembered, however, that important silver markets like Bombay and London impose many restrictions on the movement of silver. Such restrictions, if rigid enough, will enable a country to maintain the same domestic price for silver that prevailed before devaluation. This is what has happened in Bombay.

The case is different in Mexico. The price quoted by the Bank of Mexico to silver producers is the peso equivalent of the New York price, less taxes. The exchange rate of the peso has dropped from 4.86 to the dollar in December 1947, to 8.64 in December 1949, a decline of 43.7 percent. Since last June the rate has remained close to 8.64 (11.57¢ to one peso). During the same two-year period the general price level in Mexico did not rise more than nine percent. The average New York silver price remained about the same over this period. It would appear that, taking into account the slight general price rise, the Mexican silver producer has received profits about 34 percent greater than was the case before the first of the series of Mexican devaluations early in 1948.

WORLD PRODUCTION †

	1949	1948
North America	123,500,000 oz†	115,988,000 oz
South America	22,600,000 oz†	20,535,000 oz
Europe	‡	15,000,000 oz
Asia	2,000,000 oz†	3,000,000 oz
Africa	5,000,000 oz†	5,613,000 oz
Oceania	9,000,000 oz†	10,360,000 oz
Total	162,100,000 oz†	170,496,000 oz

* Bureau of Mines.
† Estimate.
‡ Not available.

This is not wholly true because the producer must pay an increased production tax and a 15 percent ad valorem export tax, imposed last fall.

It can be seen, therefore, that a device whereby profits on silver may be increased is available to the Mexican producer through exchange manipulation. American silver producers cannot avail themselves of such means. If it were not for the existing statutes on silver our domestic producers would be victims of such arbitrary action as exchange depreciation, for under this procedure the foreign producer could not only precipitate a price decline by flooding the market, but he could actually afford to accept a lower price for his silver, thus forcing more of our metal mines to close. It is indeed fortunate that the Bank of Mexico is determined to support the market. This, of course, is the main reason devaluation has had little effect to date on the New York price.

The largest silver imports, as usual, came from Mexico in the amount of 52,614,583 oz. This silver was in the form of ore and base bullion and refined bullion and represents approximately 55 percent of total United States imports for 1949. The second largest amount came from Canada—10,473,118 oz (ore and base bullion and refined bullion), or approximately 11 percent of total imports. Smaller silver importations in 1949 came from Peru, Bolivia, Honduras, United Kingdom, Belgium and Luxemburg.

Domestic Production

It is estimated that domestic silver production in 1949 amounted to 34,072,405* oz, as compared with 1948 production of 37,790,083 oz—a decrease of 3,717,678 oz. Two factors contributed mainly to the decline: (1) The drop in prices of the base metals (from which silver comes as a by-product) beginning in March and continuing for several months; (2) strikes at the mines together with the strike at the Bunker Hill & Sullivan plant in the Coeur d'Alene District from August 20 to November 19. This district produced about 25 percent of all domestically-mined silver in 1948.

When all figures are available it appears that world production of silver in 1949 probably will prove to be slightly greater than in 1948.

As usual the largest producer of silver was Mexico. Her production is estimated at 50,000,000 oz, which represents a slight increase over 1948.

* Bureau of Mines.

CIRCULATION

Silver dollars in circulation—Dec. 31, 1949	$168,369,800
Silver dollars in circulation—Dec. 31, 1948	162,449,330
Increase	$5,920,470
Silver certificates in circulation—Dec. 31, 1949	$2,119,919,891
Silver certificates in circulation—Dec. 31, 1948	2,058,666,800
Increase	$61,253,091
Subsidiary silver coins in circulation—Dec. 31, 1949	$954,619,665
Subsidiary silver coins in circulation—Dec. 31, 1948	945,749,890
Increase	$8,869,775
Federal Reserve Notes in circulation—Dec. 31, 1948	$23,917,722,050
Federal Reserve Notes in circulation—Dec. 31, 1949	23,261,515,477
Decrease	$656,206,573
Total money in circulation—Dec. 31, 1948	$28,223,786,079
Total money in circulation—Dec. 31, 1949	27,599,995,070
Decrease	$623,791,009

* * *

	Silver bullion securing silver certificates (ounces)	Silver dollars securing silver certificates (ounces)	Total silver securing silver certificates (ounces)
Dec. 30, 1949	1,549,376,374.6	248,971,415.9	1,798,347,790.5
Dec. 31, 1948	1,524,826,374.5	253,803,642.3	1,778,630,016.8
Increase			19,717,773.7

Canada produced about 16,900,000 oz in 1949, an increase of almost 1,000,000 oz over her 1948 production.

Seigniorage

"Free" silver in the Treasury as of December 31, 1949, amounted to 171,460,537.3 oz. This is a slight increase over the 1948 figure (169,318,842.6 oz) but is far below the high of 1,352,870,757.2 oz on hand December 31, 1941. Two factors are largely responsible for this:

(1) The Treasury began lending silver to industry in June 1942 (by agreement of May 6, 1942) for use principally as bus-bars in war plants. Altogether 902,622,278 oz were loaned for industrial purposes, of which 499,101,737 oz had been returned to the Treasury by December 31, 1949, leaving 403,520,541 oz still outstanding. A part of the total was taken from the seigniorage fund and the remainder from the reserve that constitutes backing for silver certificates outstanding.

(2) During World War II, the United States lend-leased to other countries 410,814,344.9 oz. The only silver returned so far amounts to 261,333.33 oz which came from Belgium and represents the total amount lend-leased to that country. All of the lend-leased silver came from the "free" silver in the Treasury. About 75 percent of the silver lend-leased went to Great Britain (88,073,878.21 oz) and India (225,999,903.83 oz). Great Britain underwrote India's entire silver lend-lease debt.

All silver received by the Treasury in the past year was acquired under the Act of July 31, 1946, at 90.5¢ per fine ounce (with the exception of 139 oz at 71.11¢ acquired under the Act of July 6, 1939).

Silver certificates in the amount of $31,907,721 were issued against silver acquired in 1949. Silver certificates issued in 1948 amounted to $33,874,747. These issues represent 70 percent of total monetary value of silver acquired in these years, respectively, from domestic mines. The remaining 30 percent (difference between Treasury buying price of 90.5¢ and the monetary price of $1.29) is profit (seigniorage to the Government). Silver in the latter category is carried on Treasury books at cost until coined, or sold.

Domestic Coinage

United States mints coined 13,515,076 oz of silver into half dollars, quarter dollars and dimes during 1949. Minting the same types of subsidiary silver coins in 1948 consumed 26,717,039 oz. The minting of domestic silver coins for 1949 will not exceed 50 percent of silver consumed in domestic silver coinage during 1948. This sizable drop in silver consumed in domestic coinage in 1949 is due in part to the monetary contraction that has taken place as a result of the recent business recession.

INTERNATIONAL MOVEMENTS OF SILVER *

EXPORTS

Year	Ore and Base Bullion (ounces)	Refined Bullion (ounces)	U. S. Coins (Dollars)	Foreign Coin (Dollars)
1948	4,151	1,277,216	$567,000	$10,871,279
1949 to Dec. 28	....	3,015,043	1,142,000	19,953,980

IMPORTS

Year	Ore and Base Bullion (ounces)	Refined Bullion (ounces)	U. S. Coins (Dollars)	Foreign Coin (Dollars)
1948	33,976,092	48,579,073	$2,423,197	$5,789,788
1949 to Dec. 28	32,796,733	62,475,889	1,279,798	3,997,602

* Department of Commerce figures.

Treasury Acquisitions

Acquisitions of newly mined domestic silver follows:

1949—33,030,768 oz (97 percent of 1949 domestic production)
1948—36,789,373.31 oz (97 percent of 1948 domestic production)

In addition the following silver was acquired during 1949:

Silver "ordinary"†	156,828 oz
Uncurrent silver dollars to be recoined	181,481 oz
Subsidiary silver to be recoined	1,346,832 oz
Silver loaned to industries through RFC during war returned	2,997,789 oz

Coinage for Foreign Governments

United States Mints coined silver for China, Mexico, Saudi Arabia, Venezuela, and Cuba in 1949. Total silver consumed was 30,266,279 oz, 22,660,000 oz of the total going into coins for China in the form of Chinese dollars.

A decree issued by the Mexican Congress at the end of the year authorized the minting of one-peso, 50-centavo, and 25-centavo coins. The one-peso coin will have a gross weight of 13⅓ grams and will contain 4 grams of fine silver. The smaller denominations will contain correspondingly less.

It is reported that the French Government has under consideration a plan to mint 100-franc silver coins. Details are lacking, but this development indicates a growing trend to expand the use of silver currency on the Continent.

Industrial Consumption

Industrial silver users in the United States consumed approximately 90,000,000 oz in 1949, a decline of 20,000,000 oz from the record peace time level in 1948. This decline was in part attributable to a decreased demand for sterling and plated silverware.

The use of silver in the electrical field for brazing alloys and other industrial purposes was off slightly from the 1948 level of 28,500,000 oz. The photographic field also consumed about 16,000,000 oz, which was slightly less than in 1948.

Industrial uses of silver in England accounted for about 11,500,000 oz in 1949, a decrease of 2,500,000 oz from 1948. Canadian industrial consumption increased by about 15 percent in 1949, up to 5,200,000 oz. Industrial consumption in Mexico in 1949 is estimated at 1,250,000 to 2,000,000 oz, an appreciable increase over the 1948 level. Consumption in India is estimated between 30,000,000 and 40,000,000 oz, only a small portion being used for industrial purposes.

Silver Legislation

On January 11, 1950, Senator Green (D., Rhode Island) introduced in the Senate of the United States a bill (S. 2829) to repeal all silver purchase legislation enacted since 1933. Such action usually confronts the silver producers of the West near the start of each session of Congress. This time, however, the measure has been condoned in spirit by the Report of the Subcommittee on Monetary, Credit, and Fiscal Policies of the Joint Committee on the Economic Report. This report was also distributed on January 11, but released for publication two days later. It recommended "that the United States Government cease buying silver for monetary purposes."

If this legislation is enacted we can look to the closing down of the mines that produce silver as a by-product, including the copper, lead and zinc mines of the west. I know that if a fight develops on this issue my friends of the West will join me in my continued determination to defeat the enemies of the silver miner.

† "Silver ordinary" is not included as money along with other Treasury acquisitions since it comprises silver acquired as a result of refining gold bullion and from sweepings at the mints. This silver is carried on the books at cost. In 1942 and 1943 "silver ordinary" in the amount of 4,699,877 oz was sold by the Treasury for war industrial uses.

Freeport, Tex., plant of Dow Chemical Co. was sole 1949 magnesium producer

Light Metals

Production of Aluminum Declined—Magnesium Use Increased—Interest in Titanium Grew

By RICHARD H. MOTE and HORACE F. KURTZ
Commodity Specialists, Metal Economics Branch
U. S. Bureau of Mines

EXCEPT for the period of general industrial decline that occurred during mid-summer, consumer demand for aluminum and aluminum products was at a high level throughout 1949, and primary metal production was maintained at a near-record peacetime rate. Some difficulty was experienced by producers during part of the year owing to labor problems and electric power shortages and as a result output dropped about 22,000 tons or four percent from the 1948 record.

In contrast, magnesium production increased 15 percent owing to expanded demand that resulted in some reduction of producers' inventories. Output in 1949, however, was at a comparatively low rate, representing about 50 percent capacity of the only primary magnesium plant which operated—that of the Dow Chemical Co., at Freeport, Texas.

Price stability continued to be an important economic factor in the aluminum and magnesium industries. Unlike other major construction materials, the market price for both metals remained unchanged throughout the year at levels below the prewar prices of 1939.

Production of metal at a price low enough to stimulate large scale use was the principal problem confronting producers of titanium in 1949, the second year of output. Both industry and Government conducted research on an expanded scale in an effort to solve the cost problem and other technical and economic difficulties which now prevent widespread use of titanium and titanium alloys as primary structural materials.

Aluminum

Based on data for eleven months of 1949, it is estimated that the year's total primary aluminum production in the United States will slightly exceed 600,000 short tons, a drop of over 22,000 tons or four percent from the record peacetime output established in 1948. This decline was largely attributed to labor strikes at certain reduction plants in the latter part of 1949 which more than offset the increased rate of production existing during each of the first seven months of the year. Power shortages in the Northwest, resulting from near-drought conditions during part of the year also curtailed output.

Primary supplies were supplemented by an estimated 172,000 tons of aluminum recovered from scrap in 1949. This figure represents a reduction of over 100,000 tons from the quantity derived from secondary sources in 1948 and reflects the virtual exhaustion of the huge stocks of obsolete wartime aircraft. Secondary ingot, which was selling considerably higher than corresponding grades of primary ingot at the beginning of the year, experienced a large reduction in both output and price by mid-summer. A partial recovery occurred toward the end of the year, however.

The domestic aluminum supply was further augmented by imports of primary aluminum in crude form which, based on ten-months' statistics, totaled approximately 70,000 tons in 1949. Shipments from Canada, the chief source of the imported metal, were down about 20 percent from the 1948 figure.

Labor-management disputes, resulting in plant shutdowns, were the

most significant factor adversely affecting production of primary aluminum in 1949. The first labor strike, beginning in August and terminating late in September, lasted seven weeks and forced closure of Reynolds Metals Co.'s Hurricane Creek alumina plant and the Jones Mills facilities, both in Arkansas. A second strike, extending from October 17 to December 7, closed nine Aluminum Co. of America plants, including the huge reduction plant at Alcoa, Tenn., and a smaller operation at Badin, N. C.

Consumer demand for primary aluminum far exceeded the productive capacity of the industry in the early part of 1949 but the supply position improved by mid-summer as a result of lowered demand during a period of general industrial decline, together with a second-quarter output which was the greatest for any three-month period since the third quarter of 1944. During the latter part of 1949 some stringency in supply reoccurred owing to increased demand. This condition was expected to be alleviated in 1950 with the completion of additional reduction capacity.

Initial operation of the new Aluminum Co. of America's plant at Point Comfort, Texas, the first reduction plant constructed since the close of World War II, is expected early in 1950. Utilizing natural gas for fuel to generate electric power, the installation will include a three-pot-line reduction plant with a capacity of about 57,000 tons per year. Additional production capacity will be brought into operation at Jones Mills, Ark., by the Reynolds Metals Co. with the expected reopening of the idle portion of its plant at that locality. Possible future increases in productive capacity are being considered by Alcoa and Reynolds and during 1949 these firms conducted surveys as to the feasibility of constructing reduction plants in British Columbia where there is an abundance of water power for generating electrical energy.

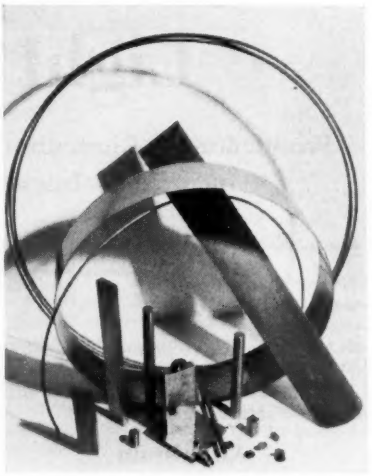
Of the many additions to fabricating plant facilities in 1949, one of the largest was Alcoa's new rolling mill at Davenport, Iowa, capable of producing sheets and plates of greater dimensions than heretofore. Reynolds increased its capacity for producing foil, bar, rod, wire, and cable through a large expansion program at Listerhill, Ala. Kaiser Aluminum & Chemical Corp., whose name was changed in 1949 from the Permanente Metals Corp., also expanded plant facilities in 1949 and is now producing foil at its redesignated installation in Permanente, Calif., as well as electric-power cable at the Newark, Ohio, plant, which it purchased during the year from the General Services Administration. The GSA sale in July of the alumina plant in Baton Rouge, La., and the Mead reduction plant and Trentwood rolling mill in Spokane completed ownership of all surplus Government alumina and aluminum plants operated by Kaiser. A new plant at East St. Louis, Ill., for production of flouride chemicals was completed during the year by the Aluminum Co. of America. Construction on Alcoa's new wire, rod, and cable mill at Vancouver, Wash., was nearly completed at the end of the year and the company expects to begin operations in the spring of 1950. Plans for broadening the Kaiser Aluminum interests to include operations in the field of aluminum extrusions were anticipated in 1950.

A decision by the Munitions Board to place aluminum on the positive list of strategic materials for Government stock piling was welcomed by the aluminum industry in December. A total of 30,000 tons were authorized for procurement in fiscal year 1950, of which 18,000 tons were to come from Kaiser Aluminum & Chemical Corp. as partial payment for a Government-owned plant it had purchased, and 12,000 tons from Reynolds Metals Corp. in lieu of rent on a Government-owned plant that it leases.

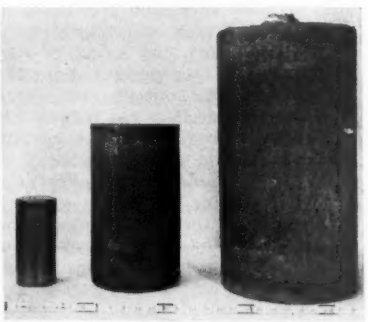
In the consumption of aluminum, the manufacture of structural products continued to be the most important use, although utilization in the field of transportation became more significant during the year. Use patterns for 1949 and comparable figures for 1948, based upon shipments of ingot and mill products by the Aluminum Co. of America, are given in the following table. Although these data may not fully parallel the whole aluminum industry, they are indicative of the growing importance of aluminum use in the several categories. Aluminum continued to find wider use and greater diversification in building products and roofing, siding, insulation, heating ducts, window frames, screens, rain spouts and gutters, and tile for bathrooms and kitchens were among the many important outlets for the metal in this field. A contract announced early in 1949 between Reynolds Metals Co. and the Wisconsin Electric Cooperative for the purchase of large quantities of power cable emphasized the growing importance of aluminum for use in electric transmission facilities. Farmers and rural America, already familiar with aluminum in the form of roofing, witnessed during the year increased use of the metal for portable irrigation pipe and grain storage bins.

Uses of Aluminum

	Percent of Total	
	1948	1949
Building products	18	17
Transportation (all forms)	13	17
Power transmission (conductors)	6	8
Cooking utensils	9	7
Household appliances	9	7
Machinery (general and electrical)	4	5
Shipments to fabricators for further processing	25	23
All other uses	16	16
	100	100



Titanium ingots of 10, 100 and 400 lb



Titanium is fabricated into a variety of shapes

Notable from the list of numerous technological advances made in 1949 are the development of new alloys, new welding, brazing, and soldering processes, new casting and forging techniques, and improved finishes and finishing procedures.

Domestic aluminum prices, unlike those for all other major construction materials, remained unchanged throughout 1949 at a level below prewar years. Base prices for 99 percent plus virgin ingot and pig were quoted at 17.0¢ and 16.0¢ per pound, respectively. Prices of 99—99.5 percent virgin aluminum ingot in the United Kingdom advanced from £87 to £90 on April 1, and to £93 on August 15. Following devaluation of the British

Pound in the latter part of 1949 the price was adjusted to £112.

Domestic bauxite production dropped about 23 percent in 1949 but imports remained virtually unchanged from 1948. Based on data for the first nine months of the year, it is estimated that bauxite output for 1949 will total approximately 1,120,000 long tons (dried equivalent). About 95 percent of the total came from Arkansas mines and the remainder from operators in Georgia and Alabama. As in the production of aluminum metal, labor strikes were a significant factor in limiting domestic bauxite output in 1949. Production from operations of the Reynolds Mining Corp., the largest domestic producer, were sharply curtailed as a result of a strike lasting nearly two months. Surinam remained the leading source of foreign ore despite increased shipments from Indonesia during the year.

An Arkansas strip pit produces bauxite to supply a portion of domestic requirements

Activities in the foreign field included the metallurgical research and exploratory programs conducted by Reynolds Metals Co. and Kaiser Aluminum & Chemical Corp. on the large low-grade bauxite deposits in Jamica and Haiti.

Magnesium

Production of primary magnesium in the United States was estimated at 11,500 short tons for 1949 compared with 10,003 tons in 1948. The estimates, based on figures for the first ten months, placed consumption and sales near 13,000 tons, as inventories at the Dow Chemical Co.'s Freeport, Texas, plant were slightly reduced from the beginning of the year. The Freeport plant, which extracts magnesium from sea water by the electrolytic process, remained the only producer of primary metal and maintained output throughout the year at a nearly constant level.

In May, the Federal Works Agency announced the sale of the Government-owned portion of the Freeport plant to Dow for approximately $2,000,000. The acquisition of these facilities will roughly double Dow's mannesium producing capacity at Freeport. Production in the new section was expected to be resumed in 1950.

Wrought Magnesium Corp., a newly-formed subsidiary of Brooks and Perkins, Inc., anticipated production in 1950 from its new Detroit plant, which will have a rated annual capacity of 3000 tons of sheet and plate, both of which were in short supply during most of 1949.

Throughout 1949, the base price of standard virgin magnesium ingot remained unchanged at 20.5¢ per pound, the price established in January 1943. The stability of primary magnesium prices and the reductions made in certain manufacturing processes have been one of the major selling points during the postwar period.

Shipments of both magnesium castings and wrought products increased considerably during 1949. Based on data through November, total shipments of castings were estimated at 4700 tons, a gain of 14 percent over 1948, while shipments of wrought products were over 4000 tons, an increase of 38 percent.

Titanium

During the past several years titanium has been attracting widespread interest as a potential industrial metal. Although production has only recently moved from the laboratory to the pilot-plant stage and the limited output is measured in hundreds of pounds, the metal's many desirable physical properties portend an application potentially equal to that of stainless steel and strongly competitive to that of aluminum and magnesium. Metallurgists substantiate this optimistic viewpoint by pointing to titanium's

(1) High resistance to corrosion, which equals that of platinum and exceeds that of nickel, stainless steel and the cupro-nickel alloys in a salt water media.

(2) Exceptional strength. Titanium alloys have been developed with a tensile strength equal to stainless steel at a saving of 40 percent in weight.

(3) Amenability to surface hardening which suggests possible applications in machine parts such as pistons, cylinders and other engine components requiring abrasion resistence.

(4) Low electrical and thermal conductivity approximately three percent of corresponding values for copper.

(5) Ability to be easily welded, forged and hot-worked.

(6) Abundance in the raw material form. It is the ninth most common element and the fourth most abundant structural metal in the earth's crust. Only aluminum, iron and magnesium are more abundant.

Despite titanium's abundance as a raw material and its desirable properties there remain a number of technical and economic problems confronting its utilization which must be surmounted before widespread use as an engineering material is established. In 1949, as in 1948, intensive research by industry and Government involving large expenditures was devoted to solving these difficulties, the biggest of which is the problem of producing metal at a price low enough to attract large-scale use.

During the year duPont quoted prices of $5.00 per pound for titanium sponge and $7.50 per pound for 100-lb ingots. Titanium sheet and bar quotations ranged from $15-$20 per pound. Other problems such as improving the machinability of the metal and developing alloys that exhibit the mechanical and corrosion-resistant properties of titanium but also include much greater amenability to conventional melting, casting, and fabricating techniques, also received attention during the year.

Domestic metal production in 1949 was at an expanded rate as compared with 1948, the first year of commercial output. One pilot plant operated continuously throughout 1949 with an output of approximately 100 lbs per day and a second pilot plant with larger capacity began production near the close of the year. In Canada, Dominion Magnesium, Ltd. produced titanium metal at its Government-built pilot plant at Haley, Ontario.

(*Continued on page* 115)

When completed, this sulphur vat will contain about 500,000 tons

Sulphur in 1949

Production Held at High Level

By W. W. DUECKER
and
E. W. EDDY
Texas Gulf Sulphur Co., Inc.

PRODUCTION of sulphur during 1949 is estimated at 4,750,000 long tons and closely approximated the record output of 1948. This tonnage includes only the native sulphur produced by the four companies operating the Frasch or hot-water process at mines on the Gulf Coast. As in the previous year, production came from seven mines; namely, Grande Ecaille, La., Boling, Clemens, Hoskins Mound, Moss Bluff and Orchard in Texas.

The capacity for shipping, as well as the capacity for production, were both heavily taxed to meet the demand throughout the year. As before the war, the major portion of the sulphur for both overseas and domestic consumers moved by water through Galveston, Texas, and Port Sulphur, La. Total shipments are estimated at 4,800,000 tons, only 4 percent less than the 1948 total. Figures for 1949 and earlier years are given in Table I.

At Grande Ecaille the Freeport Sulphur Co. completed an expansion and remodeling program costing several million dollars which resulted in increased production in 1949. Texas Gulf Sulphur Co. opened a new mine at Moss Bluff, Tex., in 1948 where production continued on a limited scale. In spite of the expansion of producing facilities, stocks of sulphur above ground for the industry as a whole continue to show a decline, and it is expected that when final figures for the year's end are available, stocks at the mines will be down about 50,000 tons as compared with the first of the year. However, in 1950 the industry expects an increase in its stock piles at the mines.

Domestic Shipments

Domestic shipments declined 10 percent, correlating closely with a decrease of 9 percent in industrial production as measured by the Federal Reserve Board index. The sharp cutback in rayon production earlier in the year and stoppages in coal and steel held back domestic uses of sulphur in spite of continued high level of demand in the fertilizer industry.

Foreign Requirements

Total 1949 exports were close to 1,400,000 long tons with Canada and Cuba taking 250,000, and 1,150,000 tons going overseas. In 1949 over 60 percent of the overseas exports went to Marshall Plan countries. Sulphur lends itself to a quick rehabilitation of the chemical and fertilizer industries as acid plants using sulphur can be built and put into operation quickly. Through such means the foreign countries may become increasingly self supporting in the growing of the foodstuffs which have been so badly needed and which have had to be imported during the elapsed interval since the close of hostilities. The tonnage shipped to Marshall Plan countries in 1949 was nearly three times the average shipped to the same countries in 1937-39, a period when large quantities of Italian sulphur and European pyrites were used.

Italian sulphur mines have not been put back in full operation, and production for the first six months of 1949 was reported to be 85,392 metric tons or less than half the prewar rate of production. Japan and Chile have been exporters of sulphur in the past and Chile continues to export into the Argentine and Brazil such quantities as are not needed for domestic consumption. Japan is recovering her producing capacity, but as yet has had no surplus for export.

Although U. S. sulphur continues in great demand due to its purity and low price, many countries continue to foster plans to reduce their imports, according to W. T. Lundy, "Sulphur and Pyrites," a chapter in "Industrial Minerals and Rocks," AIME, N. Y., 1949. Argentina requires sulphur consumers to purchase part of their requirements from domestic producers at prices considerably higher than the cost of imported sulphur.

Recovered Sulphur

In recent years increasing interest has been shown in obtaining sulphur from coke oven, refinery, natural and other industrial gases. Of particular interest has been hydrogen sulphide which can be burned directly to obtain sulphuric acid or converted to elemental sulphur. In 1948, 44,369 long tons were recovered from this source mainly by the Mathieson Chemical Co. at plants in McKamie and Magnolia, Ark. In 1949, Standard Oil Co. (Indiana), Stanolind at Elk Basin, Wyo., and Hancock Chemical Co. at Los Angeles, placed in operation two new recovery plants having a combined capacity in the neighborhood of 40,000 long tons of sulphur per year. Three other plants—the Freeport Sulphur Co., at Eagle Point, N. J.; the Texas Gulf Sulphur Co., at Worland, Wyo.; and the Heyden Chemical Co., at Morgantown, W. Va.—having a combined anticipated capacity of around 140,000 long tons of sulphur a year, were being installed and should be ready for operation early this year.

TABLE I

Sulphur Industry in the United States

Long Tons	1937-39 Average	1948	1949 Estimated
Production of crude sulphur	2,408,786	4,869,210	4,750,000
Shipments of crude sulphur	2,109,725	4,978,912	4,800,000
For domestic use	1,482,317	3,715,999	3,400,000
For export	627,408	1,262,913	1,400,000
Stocks at mines end of year	4,000,000	2,694,449	2,650,000
Production of domestic pyrites	552,068	928,531	950,000
Sulphur content	221,000	388,000	400,000
Imports of pyrites	447,000	107,411	140,000
Sulphur content (a)	210,000	48,000	63,000
Short Tons			
Sulphuric acid from smelter gases 100 percent	594,000	641,445	725,000
Equivalent sulphur in smelter acid	201,000	215,000	245,000
Sulphuric acid production, 100 percent (b)	4,795,002	10,231,111	10,100,000

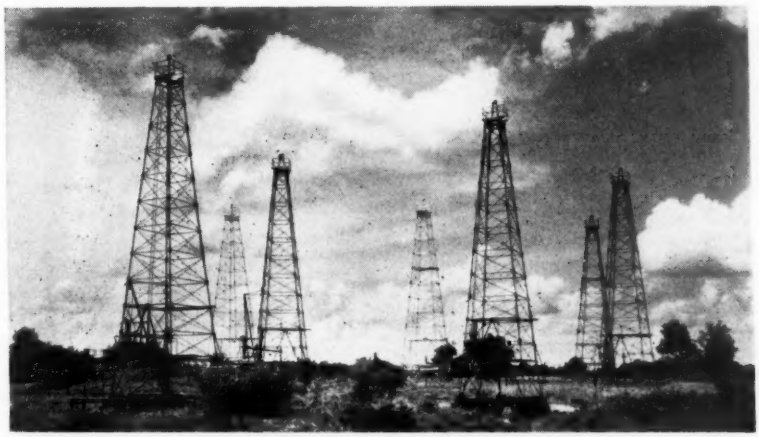
(a) Estimated at 45%.
(b) New acid, not including fortified spent acid, 719,186 in 1948 and 750,000 in 1949.

Sulphuric Acid

The major portion of all native sulphur consumed in the United States is converted into sulphuric acid before entering its ultimate use. The acid is used for fertilizer, in refining petroleum, in the manufacture of chemicals, coal products, iron and steel, paints, rayon, textiles, etc. The largest use for sulphuric acid is in fertilizer manufacturing and synthetic ammonium sulphate, made from synthetic ammonia, and sulphuric acid, is a new market for acid which did not exist prior to the war. Sulphuric acid is also used in the manufacture of synthetic detergents which have developed rapidly in the last few years. The American Smelting and Refining Co. is building a new sulphuric acid plant with 120-ton daily capacity at Tacoma, Wash., utilizing sulphur dioxide from smelter operations and is approximately doubling the capacity of existing acid plants utilizing smelter gases at Corpus Christi, Texas and Garfield, Utah. A liquid sulphur dioxide plant is being installed by Tennessee Copper Co. at Copper Hill, Tenn. Anaconda's copper smelter in Montana has just increased its acid capacity by 235 net tons of 60 deg Bé acid per day. Production of smelter acid should increase sharply in 1950 as the new acid capacity is fully utilized.

The Future

Despite the increasing use of by-product sulphur and gases containing sulphur, the shipments of Frach process sulphur in 1950 should continue at a high level. Strong domestic demand for sulphuric acid is expected to continue as the outlet for the largest use of this acid; namely, fertilizer, has apparently gone to a much higher level than before the war. The newly developed uses for acid, such as in the production of detergents, ammonium sulphate, etc., are expected to continue to expand according to the best market surveys. Since sulphur is essential for all branches of the chemical industry, domestic and export shipments should continue in good volume, though foreign demand may not be as great as that of 1949.



Single station pumps sulphur from seven wells

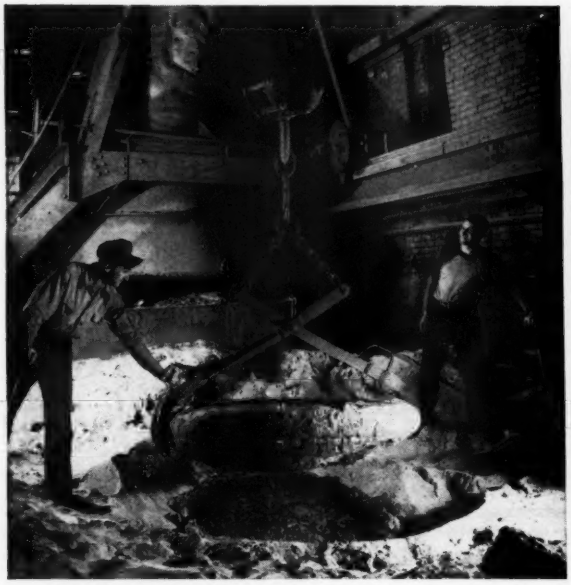
Light Metals

(*Continued from page* 113)

The chief raw material source of titanium is ilmenite ore, most of which is currently used for titanium pigments. Domestic output in 1949 was at a record high of 399,000 short tons, containing 191,000 tons TiO_2. Properties contributing to this peak output include the Starke, Fla., operations of the E. I. du Pont de Nemours & Co., which began producing early in 1949; the MacIntyre mine of the National Lead Co. near Sanford Lake at Tahawus, N. Y., generally considered to be the world's largest titanium mine; the Rutile Mining Co. of Florida, near Jacksonville; the Riz Mineral Co., near Vero Beach, Fla., Yadkin Mica and Ilmenite Co., Finley, N. C.; Calco Chemical Division, American Cyanamid Co., Piney River, and American Rutile Corp., Roseland, both in Virginia; and Ferro-Titan Minerals Co., Los Angeles County, Calif. Development of the Allard Lake, Quebec, ilmenite property, jointly operated by the Kennecott Copper Corp., and the New Jersey Zinc Co., continued during 1949.

Imports of ilmenite for the first ten months of 1949 were 295,000 short tons, a 29 percent increase over the 228,000 tons received during the same period in 1948. India was the principal source of imports in both years.

The average quotation per gross ton for ilmenite, containing 56-59 percent TiO_2, fob, Atlantic seaboard, dropped in three successive reductions during the year from a range of $18-$20, depending upon grade and impurities, to $14-$16.



Ferroalloy for the steel industry consumes 70 percent of domestic molybdenum production

Converting molybdenum into ferroalloy for use by the steel industry

Ferroalloys in 1949

Dependence Upon Foreign Sources for Certain Vital Elements Dictates Aggressive Search at Home

By EDWIN K. JENCKES
Industrial Specialist
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HOWEVER trite it may sound, it is inescapable that the ferroalloy industry is inextricably bound to the art and science of steel making.

The work stoppage in the steel industry in the fall of 1949 has caused a loss in production of steel ingots and castings which may amount to 8,000,000-9,000,000 tons—say ten percent of the expected output. Obviously this situation is a serious one for the producers of the ores of the alloying additives, who are faced with the alternatives of increasing inventories and paying interest on the capital so invested, or with curtailing or even suspending mining operations with the accompanying economic evils. A further complication is that during the first nine months of 1949 the output of alloy steel dropped to approximately 7½ percent of the total steel produced as compared to 9½ percent in 1948. Whether this is a normal falling off to the prewar levels or a retrenchment in purchase of higher cost (alloy) steel remains to be seen. Certainly, the *over-all demand* for steel does not seem to have declined to the same extent.

It is certain that the ferroalloy industry has felt an unfavorable reaction, although there are indications that it was not entirely a direct result of the steel work stoppage; unless, indeed, the decline in the use of the additive elements throughout the early part of the year was a reflection of an impending forced cessation of steelmaking. A glance at the individual members of the group will make this clear.

CHROME—During 1948 the quarterly consumption held well over 200,000 short tons, and in the first quarter of 1949 it was over 236,000 tons, but the second and third quarters showed successive and marked declines. At the same time domestic production—never large in peacetime—was almost negligible. Imports, however, were not too far below the all time record set in 1948. The most important exporting countries (in the order of magnitude of U. S. imports) were the Philippines, Turkey, Union of South Africa, Cuba, Southern Rhodesia and New Caledonia.

A most fruitful field of domestic endeavor lies in the twin programs of intensive systematic prospecting to discover deposits of high grade ore, and of the development of new, or adaptation of known, methods of utilization of the known deposits of low grade domestic ores to a point at which their use will be economically feasible.

MOLYBDENUM—In 1949 production, shipments and consumption were markedly below the 1948 level. The stocks of concentrates above ground at the end of 1949 will probably be somewhat less than the December 31, 1948 figure, but this decline will be offset by a gain in stocks of molybdenum products.

For 23 years prior to 1947, Colorado was the largest producing state, by virtue of the output of the Climax Molybdenum Corp. from their mine at Climax, Colo. In 1947, the premier producer was Utah. The sole producer in Utah is the Utah Copper Division of the Kennecott Copper Corp., which company recovers molybdenite concentrates as a by-product of its copper concentrators. In 1949 the premier position has alternated between the two states, Colorado holding it in the first and third quarters and Utah in the second.

TUNGSTEN—As 1949 progressed domestic production, imports for consumption and consumption of concentrates declined progressively. There seem to be two reasons for the decline

in the domestic output; namely, the decrease in consumption and the widening gap between the price of the domestic product and the duty-paid cost of imported concentrates. This condition has resulted in the shutting down of the largest domestic producer, the Nevada-Massachusetts Co., and at least two other companies have curtailed their operations.

Since news dispatch accounts of the advances of the Chinese Communist forces establish the fact that the tungsten producing areas of China have passed into their hands, it seems entirely probable that this historic source of tungsten may be lost to the United States.

MANGANESE—The United States produces approximately ten percent of its requirements, the balance coming from imports. Domestic mine shipments were slightly less than in 1948, but an increase in imports in 1949 more than compensated for the decrease in domestic production. Shipments of metallurgical and battery grade ore from Montana comprise well over 90 percent of our domestic production.

The leading exporting countries are India, Union of South Africa, Gold Coast, U. S. S. R., Brazil and Cuba. Ten other countries contributed to the U. S. imports in markedly smaller quantities. The discovery of manganese ore in Canada near the Quebec-Labrador border may place a new source of supply close at hand.

The recommendations made above with regard to the domestic chrome supply apply equally well in the case of manganese.

VANADIUM—The United States seems to be attending a progressively higher degree of self-sufficiency with regard to supplies of vanadium. The percentages of the new supply[1] furnished by the domestic vanadium industry 1940-47 have been: 1940, 45.6; 1941, 54.2; 1942, 63.5; 1943, 72.9; 1944, 72.8; 1945, 67.0; 1946, 61.2; and 1947, 66.9. It can be seen that domestic vanadium mining not only responded to the unprecedented wartime demands, but also that since the cessation of hostilities it has been able to hold the level of domestic production (percentagewise) substantially above the figures reached in 1940. There seems little doubt that should tonnage requirements increase our domestic mines will rise to the occasion.

This country has large reserves of vanadium-bearing ores in the titaniferous magnetites of the Sanford Lake District in New York and in the vanadium-bearing shales of the Phosphoria formation of Utah, Idaho and Wyoming.

TITANIUM — The Sanford Lake (Tahawus, Essex County, N. Y.) titaniferous magnetites and the Florida beach sands are the main domestic producers of titanium. India is the most important foreign supplier of ilmenite which is obtained from the mineral sands of Travancore.

The E. I. du Pont de Nemours and Co. are now producing and selling ductile titanium metal on a limited scale.

COBALT—The Bethlehem Steel Co. is currently the only domestic producer of cobalt. This metal is a by-product of the Cornwall iron-ore mine in Pennsylvania.

Development work at the Blackbird mine of the Calera Mining Co. near Forney, Idaho, has been in progress for several years with encouraging results.

[1] New supply equals domestic production plus import minus exports.

Ores come to the alloy plants from all parts of the world—some starting their journey many thousands of miles away

Foreign Supply Sources

However, domestic production is small in comparison with requirements and the United States is almost completely dependent on imports. Belgium, the Belgian Congo and Canada are the chief countries from which cobalt and cobalt-bearing materials are shipped to this country, with small quantities coming from United Kingdom. "Cobalt alloy" shipped to this country from the Belgian Congo is refined to metal in the plant of the African Metals Co. at Niagara Falls, N. Y. A deposit of cobalt-bearing ore in Northern Rhodesia has been reported which may become a factor in the world market if mining and refining can be established on an economically sound basis.

The fact that this is an uneasy world compels further appraisal of the problem from a viewpoint which differs in its implication somewhat from the normal peacetime supply-demand considerations. Because of present unsettled world conditions, and the possibility of future developments which might lead to losses of some foreign sources of supply, it is in order to examine closely the position of the United States in relation to the global supply of the members of the ferroalloy additives group.

In the case of eventualities the availability of off-shore sources of supply would depend entirely upon which sea lanes remained open. For example, disturbances in Europe would close the routes from the Mediterranean area (including Spain and Portugal), and from the northwestern and central coast of Africa. Conversely, eventualities in Asia would undoubtedly result in the loss of sources of supply in the Pacific area. All of the ferroalloying additives are of high strategic significance, and a quick run-down of our supply position is given below.

This group of elements runs the gamut from complete self-sufficiency to complete dependence on foreign sources of supply. On one end of the scale we find molybdenum, and here we are not only completely independent of off-shore sources of supply, but in fact we are in a position to supply about 85-90 percent of the world's production. On the other end of the scale we find elements such as cobalt, for which we are, substantially, entirely dependent upon imports.

No more than a quick résumé of this situation can be given here, but

this report would be incomplete without a quick run-down of the more important alloying additives.

MOLYBDENUM — Complete independence of foreign sources. Bearing in mind the extensive substitution of molybdenum for the scarcer additives during the war it is evidently essential that sufficiently large stocks of molybdenum "above ground" should be available. The justice of asking industry to carry this whole load is open to question.

TITANIUM—The situation with regard to titanium is not too uncomfortable. In addition to the domestic sources mentioned above the development of the titaniferous magnetite deposit—perhaps better described as ilmenite—in the Allard Lake region of the Province of Quebec may offer an easily available source of supply in case of emergency. The traditional friendship between Canada and this country makes this speculation entirely probable.

TUNGSTEN—United States production during the war rose to an unpredictable and entirely unexpected level. In so doing, the reserves of one of the largest single producers, the Yellow Pine Mine, Lake County, Idaho, were virtually exhausted.

Inasmuch as domestic production has seldom equalled or surpassed 50 percent of domestic consumption, our dependence on "off-shore" sources becomes evident. In addition to China, other important importing countries in the last two or three years have been Australia, Korea, Siam, and Netherlands Indies in the Pacific Area; Canada, Argentina, Bolivia, Brazil, Chile and Mexico in the Western Hemisphere; Belgian Congo and Southern Rhodesia in Africa; and Portugal and Spain in Europe.

VANADIUM — Today the United States may well be the world's largest producer of vanadium, and our self-sufficiency seems to be increasing rather than declining. Peru, which for many years was a reliable source of supply for a large proportion of our needs, has possibly lost this position inasmuch as the reserves of high grade ore at Mina Ragra have been badly depleted. Other sources of vanadium are the Rhodesian Broken Hills Development Co., Ltd., in Northern Rhodesia, the Adenab and Tsumeb mines in South West Africa, the minette ores of France, Belgium and Luxembourg, Japanese beach sands, and flue dust from vanadium containing fuel oils, notably those from Venezuela.

Ferrochrome in lump form is used by the nation's steel mills

MANGANESE—In 1949 the largest suppliers of manganese to the U. S. were Belgian Congo, Gold Coast and Union of South Africa (Africa); U. S. S. R. (Europe); India (Asia) and Cuba and Mexico (Western Hemisphere).

The necessity for improving our position with regard to domestic production has been pointed out above. At the same time it is essential that the positions of the probable suppliers be strengthened, possibly under "Point 4." As examples might be cited the improvement of loading facilities and inland transport in the Gold Coast, and the improvement and extension of facilities of the railroad serving the Rhodesias and the Belgian Congo.

COBALT—Since the Belgian production of cobalt comes from materials originating in the Belgian Congo, in the case of emergency the cobalt could be refined in some other country, possibly either in the Congo or in the United States.

The Canadian source would undoubtedly remain available to us.

NICKEL—Inasmuch as Canada is the world's largest producer of nickel, this country is in no apparent danger of losing its source of supply.

COLUMBIUM AND TANTALUM —No substantial quantities of these ores are produced domestically.

A large proportion of the world output of columbium concentrates originates in Nigeria.

The Belgian Congo is the world's largest producer of tantalite, with Brazil in second place.

CHROMITE—The necessity for further prospecting and research in this country has been pointed out above.

Off-shore sources of supply are Southern Rhodesia, Union of South Africa and Sierra Leone (Africa); U. S. S. R., Turkey, Greece and Yugoslavia (Europe); Canada and Cuba (Western Hemisphere) and New Caledonia, India, Japan and the Philippines (Pacific Area).

On the whole, although there are several bright spots, the complete picture is not too encouraging with regard to future supplies of the ores of the ferroalloying elements. At the moment this country is not in a bad position, but in case of an emergency, we are far from being in a comfortable situation.

There are several things which we should do—to maintain production of those ores which we have at a reasonable (but not an extravagant) level; to "scour the hills" in search of new deposits, particularly those of commercial grade; to explore every available channel for the use of any and all off-grade or sub-grade ores; to pursue a vigorous and well-balanced stockpiling program; and to use to best advantage any means at our disposal to encourage the production and importation of strategics of which we do not have a sufficient supply within our own borders.

Huge draglines are the production work horses in eastern phosphate fields

Phosphate Rock Industry of Eastern United States*

By BERTRAND L. JOHNSON
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PHOSPHATE-ROCK mining in the United States in 1949 was maintained at a high level with the marketed production estimated to have been between 8,500,000 and 9,000,000 long tons. Influences adverse to a higher production included the midyear strikes in Florida, the drop in Army shipments, the reported development of excess inventories of superphosphate, lack of storage space, and the extended strike in the potash mines of New Mexico which stopped the flow of this vital material to fertilizer manufacturers. Supplies of phosphate rock were plentiful, and are said to have been adequate to the demand. Most of these supplies, perhaps 90 percent, came from the eastern part of the United States—from Florida and Tennessee. The balance came from the Rocky Mountain field—from Idaho, Montana and Wyoming.

Florida in 1949 was by far the leading phosphate-rock producing state, its marketed production being several times that of its nearest competitor—Tennessee. The greater part of the production came, as usual, from the land-pebble phosphate-rock field. Relatively small quantities of hard rock and soft rock were produced, the latter largely hard-rock waste-pond phosphate. The production of the latter kind much exceeded that of hard-rock. Prices of Florida rock are said to have been reduced slightly during the year.

The land-pebble phosphate-rock mining companies shipping phosphate rock in 1949 were: The American Agricultural Chemical Co., American Cyanamid Co., Coronet Phosphate Co., Davison Chemical Corp., International Minerals & Chemical Corp., Pembroke Chemical Corp., Swift & Co., and the Virginia-Carolina Chemical Corp. The Armour Fertilizer Works was not yet in production.

Exports for the first ten months of 1949 (717,819 short tons) were considerably larger than for the corresponding period of 1948 (557,054 tons). Export trade, however, is reported to have been below what could have been shipped. Producers of French North African phosphate-rock are said to be favored in European markets with consequent restriction of the export of Florida rock.

Plant Improvements Made

Improvements were installed at many of the plants during the year. At the Noralyn mine of the International Minerals and Chemical Corp., new drying, storage and shipping facilities were completed. The tonnage shipped by this company in March 1949 is reported to have been the largest of any month in the company's history. In January 1949 the Davison Chemical Corp. placed a new phosphate flotation plant in operation south of Lakeland, Fla. This plant is an addition to the Pauway No. 4 washer and table plant. Large dewatering areas, hydro-separators, flotation cells and conditioner tanks were incorporated in the plant for processing accumulated rejects from previously worked phosphate matrix as well as newly mined phosphate materials. Swift & Co. produced triple superphosphate for its numerous plants in its new Agricola facilities.

Uranium has been detected in the land-pebble phosphate deposits of

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Florida and they have been under investigation by the U. S. Geological Survey since 1947, with the Atomic Energy Commission also interested in the deposits. Whether or not they have economic importance has not yet been disclosed.

In the Florida hard-rock phosphate field operations in recent years have been restricted to the joint operation of C. and J. Camp and J. Buttgenbach and Co., who have been mining and shipping hard-rock phosphate for export from their Section 12 mine near Dunnellon. They were not in production during the early part of 1949 but made shipments from stock both for export and for domestic consumption. The Dunnellon Phosphate Mining Co. has reported that its mine is permanently shut down.

The processing plant of the Fernandina Phosphate Corp. at Fernandina, Fla., used for drying and crushing hard-rock for loading on ships for export, was shut down early in 1949, but vessels called thereafter to load the remainder of the stocks. The company is reported to have announced on July 5, 1949, that it could see "no more future in the export of phosphate through Fernandina."

Exports of high-grade hard-rock phosphate in 1949 were much smaller than in 1948, being only 18,101 short tons in the first ten months of 1949 against 82,295 tons in the same period of 1948.

Several soft-rock mining companies were in operation in 1949, mining the fine-grained phosphatic residues in the old waste-pond dumps near Dunnellon, Hernando and Loncala, in the hard-rock phosphate field. Part of this material was sold for use as a phosphatic fertilizer for direct application to the soil and part for use as a filler in commercial mixed or complete fertilizers.

Tennessee retains its position as the second largest phosphate-rock producing state with a probable production in 1949 of 1,250,000-1,500,000 long tons, nearly or entirely of brown rock phosphate. Mining operations were carried on by the Tennessee Valley Authority, Columbia, Tenn., and by several private companies: Armour Fertilizer Works, Federal Chemical Co., Harsh Phosphate Co., Hoover and Mason Phosphate Co., International Minerals & Chemical Corp., Monsanto Chemical Co., Owens Agricultural Co., and the Virginia-Carolina Chemical Corp.

An advance in the price of Tennessee rock that occurred in 1949 was attributed to the increased cost of coal.

Fluorine Extraction Tests

The TVA continued its mining and phosphate-processing activities in Tennessee and its chemical plant operations at Muscle Shoals in 1949. At Columbia, Tenn., a plant-scale demonstration unit for the recovery of fluorine from phosphate manufacturing processes was placed in operation at the fused tricalcium phosphate plant. Waste gases from the furnaces are passed through a tower packed with lump limestone and the fluorine recovered as calcium fluoride. Defluorination studies completed on Florida and western-rock phosphate showed them less easily treated than the Tennessee rock but processes were devised to obtain comparative results.

TVA also carried on numerous other investigations in phosphate technology. Considerable quantities of fertilizers and intermediate products were produced. Phosphoric acid equivalent to about 68,900 tons of P_2O_5 was produced during the fiscal year ended June 30, 1949, about 12 percent more than the year before. Concentrated superphosphate production, 158,700 tons, was up 4 percent. About 3500 tons of calcium metaphosphate, and 15,200 tons of fused tricalcium phosphate, were also produced, together with more than 36,600 tons of dicalcium phosphate.

The International Minerals & Chemical Corp. installed new drying and grinding facilities at its Wales plant during the fiscal year ended June 30, 1949, with resultant improved efficiency and lowered costs. The acquisition of additional reserves has lengthened the life of the Wales mine and postponed the opening of a new Hickman County mine. The company's output from its Tennessee mines was sold as raw material for electric furnace operations and as finely ground phosphate rock for direct application to the soil.

Virginia has ceased to be a producer of phosphate rock. In 1949 there was no production of apatite at the Piney River, Va., apatite-ilmenite deposit of the Calco Chemical Division of the American Cyanamid Co. However, shipments of apatite were made from stock for export. The mine and plant were not operated in 1948 or 1949 and the shut-down is reported permanent by the company.

Western Phosphate

By GEORGE A. McHUGH
Manager of Mines
Simplot Fertilizer Company

Phosphate rock was first discovered in the western states in Utah in 1889. Near Montpellier, Idaho, commercial production was begun in 1906. Since that time the western phosphate industry has been greatly expanded in line with the development of western needs for phosphate products.

In 1949, western phosphate operations produced an estimated 850,000 dry tons. Principal producers were the Anaconda Copper Mining Co., Conda, Idaho; the Montana Phosphate Products Co., Garrison, Mont.; the San Francisco Chemical Co., Lief, Wyo.; and the Simplot Fertilizer Co.,

Pit operations at Simplot's Fort Hall mine

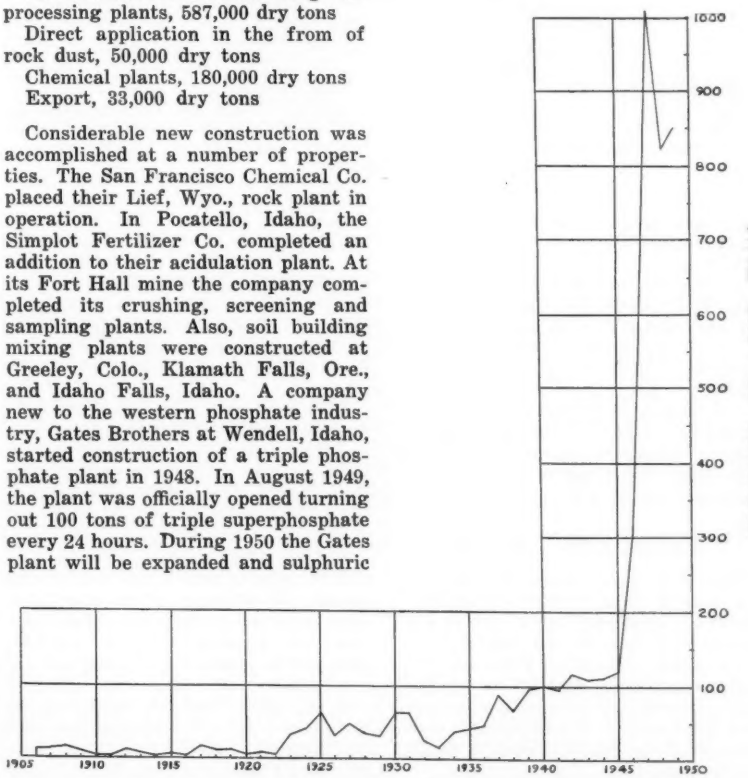
Surface plant of phosphate mine of Anaconda Copper Mining Co. at Conda, Idaho

at Pocatello, Idaho. All production came from either the Phosphoria, Park City or Embar formations.

Estimated 1949 shipments of western phosphate were as follows:

To mine-owned manufacturing and processing plants, 587,000 dry tons
Direct application in the from of rock dust, 50,000 dry tons
Chemical plants, 180,000 dry tons
Export, 33,000 dry tons

Considerable new construction was accomplished at a number of properties. The San Francisco Chemical Co. placed their Lief, Wyo., rock plant in operation. In Pocatello, Idaho, the Simplot Fertilizer Co. completed an addition to their acidulation plant. At its Fort Hall mine the company completed its crushing, screening and sampling plants. Also, soil building mixing plants were constructed at Greeley, Colo., Klamath Falls, Ore., and Idaho Falls, Idaho. A company new to the western phosphate industry, Gates Brothers at Wendell, Idaho, started construction of a triple phosphate plant in 1948. In August 1949, the plant was officially opened turning out 100 tons of triple superphosphate every 24 hours. During 1950 the Gates plant will be expanded and sulphuric acid and ammonia phosphate plants will be added. The Gates plant is the ninth plant in the United States to produce triple superphosphate by continuous mechanical process.



Phosphate rock production from Idaho, Montana, Wyoming and Utah

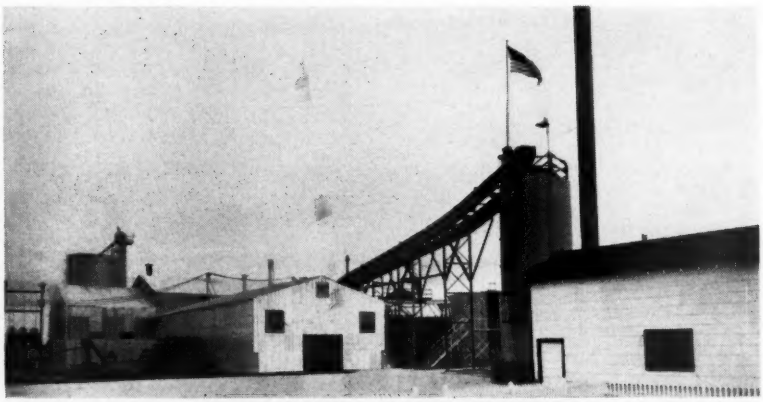
An electric phosphorus furnace was begun in 1948 by the Westvaco Chemical Division, Food Machinery and Chemical Corp. The first unit was placed in operation in August 1949. The second furnace was placed in operation in January 1950. The Simplot mine on the Fort Hall Indian reservation furnishes shale to this $4,000,000 plant west of Pocatello. In line with production from this second unit, a new phosphorus processing plant is being erected at Newark, Calif. Likewise reacting to increasing demands for phosphate products, the Anaconda Copper Mining Co. has enlarged its triple superphosphate plant at Conda, Wyo.

In addition to the four major producers, namely, Anaconda, San Francisco Chemical, Montana Phosphate Products and Simplot, no new companies entered the mining field. Although no definite data is available, it is felt that all major companies continued development work and that ore reserves were materially enhanced. Gates Brothers did some preliminary work on their Border, Wyo., holdings and McIllwee started to open up his Paris, Idaho, property.

In the metallurgical field, further experiments were continued in the beneficiation of low grade phosphate rock. Work in this important field was conducted by the U. S. Bureau of Mines, the University of Idaho and the Natural Resources Research Institute of the University of Wyoming.

Fertilizer Consumption Rises

In commenting on demand for commercial fertilizers, W. W. Hanson,



Plant of Gates Bros., Inc., Wendell, Idaho

sales manager, Simplot Fertilizer Co., states, "While consumption of commercial fertilizers in the United States for the crop year 1949 are not yet available, statistics reveal that for the period July 1, 1947 to June 30, 1948 the consumption was the highest on record, according to the U. S. Department of Agriculture.

"Shipments of superphosphate for direct application by farmers in the Intermountain and Pacific Coast States, for the period ending June 30, 1948, are as follows: Pacific Coast States used 197,000 tons which represents about 122,600 tons of the 18 percent superphosphate, 13,800 tons of double superphosphate and 61,500 tons of superphosphate as found in the higher analysis, ammoniated products. For the Intermountain States a total of 109,800 tons were used which represents about 61,100 tons of 18 percent superphosphate, 32,200 tons of double super' and 16,500 tons of superphosphate as found in other high analysis ammoniate products.

"In addition to the above consumption of P_2O_5 for direct application, probably more than 100,000 tons of superphosphate were used in mixed fertilizers in the two areas. Although the figures for the 1949 crop year are not yet released it is estimated that the consumption level has been on a par with the previous year. Fertilizer manufacturers recognize that demand and supply are moving closer together. The general contention is that the demand for superphosphate, nitrogen and potash will continue to expand and that . . . the industry is faced with a program directed towards meeting future needs."

Near Pocatello, Idaho, the Simplot and Westvaco plants produce fertilizer for western farming

New Developments At Carlsbad

(*Continued from page* 106)

of langbeinite—quite a controversial subject. We quote:

"There is no general agreement on the theory of the formation of langbeinite from Permian brines. It has been suggested by some geologists that the original sea water contained enough sulphate, etc., for the requirement but the work by W. B. Dancy appears to refute this claim.

"The additional quantity of elements required over those furnished by the inflowing sea water could conceivably have been provided by the Castile anhydrite and possibly the dolomites after they had been tilted up to the west at the time the Capitan reef was rising and the Permian basin sinking. The brines flowed northward from the ocean into Lake Ochoa, which was bounded by the reef confines except for a narrow neck to the south. The Ochoa brines were continually evaporated and spilled over into shallower evaporative basins at the reef side periphery.

"Langbeinite can be formed in the Na, K, Cl-lang-beinite system of saturated brines at a minimum of 55 C to 84 C maximum. Such conditions could have obtained in shallow desert pools.

"Evidence of sulphate migration is found in shallow wells containing saturated sodium sulphate brine, down dip from the Castile anhydrite out from Loving, N. M."

Trona, Calif., Basin

The American Potash & Chemical Co. has a total output of approximately 1600 tons of soda, potash and borax; this includes 700 tons of fertilizer grade muriate. Part of this latter tonnage is split off to produce 100 tons per day of sulphate of potash and 150 tons per day of refined, technical-grade potassium chloride, as the trade requires.

Brine is pumped from shallow wells through the dry surface of an adjoining "salt" lake, into the plant where it is evaporated and sodium salts are crystallized out. The potash is fractionated by crystallization after cooling the mother liquors, separated by centrifuging and then dried in oil fired, direct heat, concurrent rotary dryers.

The portion of the potash salts (muriate) split off is repulped, heated, and chlorinated for the removal of bromine. The latter is recovered. The brines are then clarified and recrystallized to produce refined technical grade KC1 (muriate).

Mother liquor from the potash section is cooled and recrystallized for the separation of borax. This step gave much trouble in the early years but now is an apparently simple routine. Potassium sulphate is produced by mixing KC1 (muriate), mother liquor and salt cake (sodium sulphate) to form glaserite, which is separated and reacted with fresh KC1 solution. The resultant sulphate of potash is filtered and dried.

Scrap Metals

Ferrous Scrap Consumption Falls to Ten-Year Low—Nonferrous Recovery and Consumption Declines

By CHARLES WHITE MERRILL, NORWOOD B. MELCHER and ARCHIE J. McDERMID

Respectively, Chief and Commodity Specialists Metal Economics Branch, Bureau of Mines

EARLY in 1949 the first evidences of the end of the sellers' market in metals began to appear in the secondary metals industry. The general uptrend in prices was arrested, dealers' stocks of many scrap items increased, and quantities consumed declined. The weakening of prices reached the primary metal market on March 9 with the break in lead from 21½ to 19½¢ a pound. Downward price readjustments soon involved most of the metals of the nonferrous group.

Despite the curtailment of demand resulting from the ending of the metal shortages that had persisted from the war years, the scrap industries nevertheless were still called upon to supply industry operating at a high level. However, the slowing down of purchasing by ultimate consumers induced a policy of caution in virtually all lines of production, including those concerned with output of steel ingot, nonferrous ingot, and castings. Purchasing of metal by fabricators and of scrap by secondary plants was curtailed to reduce inventories. Nonferrous smelters and refiners, unable to dispose of refined metal or alloy ingot, reduced prices until levels were reached at which fabricators and foundries reentered the market. At the lower prices for scrap, some of the sources of supply dried up, thus contributing to the balancing of supply to the falling demand. Particularly noticeable was the virtual cessation of flow of scrap from abroad early in 1949 despite the success of programs late in 1948 to accumulate and prepare large stocks ready for shipment. Lower prices also reduced the flow from domestic sources where collection was expensive and material was of the lower grades.

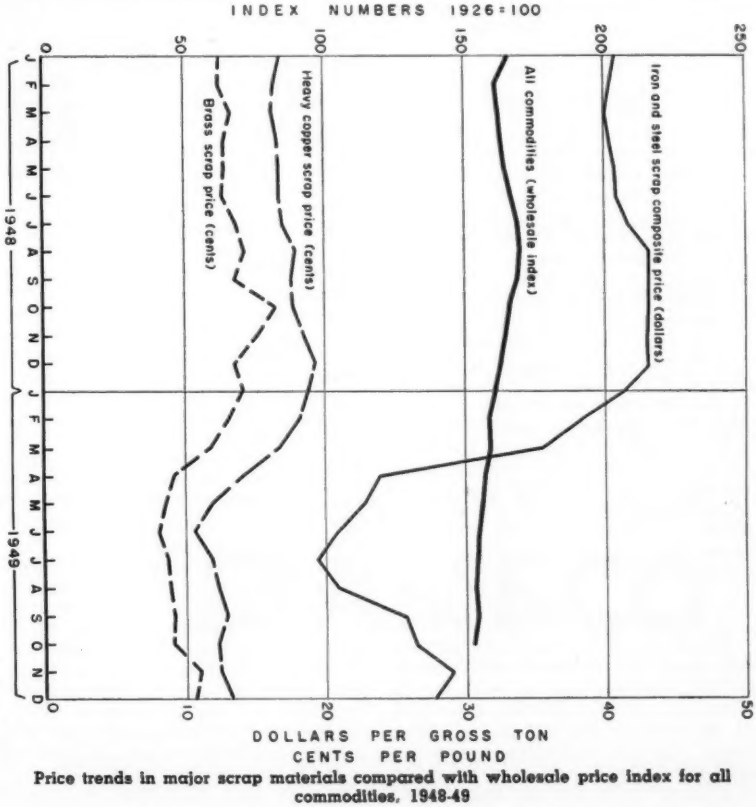
Nonferrous Metals Scrap

Under these conditions, the total consumption of nonferrous scrap metals and the resulting secondary recovery in 1949 decreased substantially. Use of all four of the principal scrap metals—copper, lead, zinc and aluminum—declined in the first seven months of the year. Activity was lowest in July, the month of vacations, plant repairs, and hot weather. From then on most secondary metal operations increased. Supplies of scrap were also smaller than in 1948. On account of the slower tempo of industrial operations, less plant scrap was generated and less equipment worn out to be returned to smelters as old scrap.

Copper and Brass—The total quantity of secondary copper recovered from scrap in 1949 by refiners, ingot makers, brass mills, foundries and manufacturers is estimated at 737,000 short tons, a 24 percent decrease from the 972,788 tons reclaimed in 1948. As usual, over 97 percent of the total secondary recovery came from copper-base scrap. Old scrap yielded about 395,000 tons or 54 percent of the total as compared with 52 percent in 1948.

Unalloyed copper produced from scrap, including refined copper, castings, copper powder, copper sheet, rod and tubing, is expected to total 256,000 tons, of which 227,000 tons of refined copper can be credited to the primary producers who made 245,376 tons of this product from scrap in 1948. Secondary copper smelters are expected to report total production of 194,000 tons of brass ingot in 1949 compared with 302,278 tons in 1948. The large decrease places ingot production below that of refined copper for the first time on record.

Lead—Lead producers, in addition to the handicaps common to others in the metal industries, had to compete with an influx of metal from "soft currency" countries, accentuated by devaluation of the pound on September 18. Business of secondary lead plants, which was improving in August and September, relapsed in the final quarter of the year, and the price of the metal dropped to 12 cents on November 21. Final figures for 1949 are expected to show a total of around 390,000 tons of lead recovered from scrap, a decrease of 22 percent from the 500,071 tons recovered in 1948. Domestic mine production of lead will probably exceed 390,000 tons and in that event should surpass secondary recovery for the first time in four years. Total consumption of lead-base scrap in 1949 is estimated at 531,568



Price trends in major scrap materials compared with wholesale price index for all commodities, 1948-49

tons and of battery lead plates, the principal individual item, at 309,004 tons. The corresponding quantities for 1948 are 643,560 and 384,431 tons.

Aluminum—Recovery of aluminum from scrap declined 40 percent in 1948 to an estimated 172,000 tons from the 286,777 tons reclaimed in 1948. That this decrease was so much greater proportionally than the decline in recovery of the other nonferrous metals can be attributed chiefly to the exhaustion in 1948 of the last stocks of obsolete and wrecked aircraft which had accumulated during the war years and to the increased availability of primary metal. In previous years the war aircraft scrap had provided a large and cheap source of secondary aluminum which was all the more welcome because primary production could not satisfy the demand for the white metal. As primary production in 1949 remained at virtually the same high rate as in 1948 and demand was weaker, plants that had been using secondary ingot could change to primary if they so desired. Production of aluminum alloy ingot by secondary smelters and four naval air stations is expected to total approximately 110,000 tons compared with 190,039 tons in 1948.

Zinc—Recovery of secondary zinc in 1949 from zinc-, copper- and aluminum-base scrap is estimated at 231,428 tons—29 percent less than the 324,639 tons reclaimed in 1948. The recovery was divided about equally between zinc and copper scrap, not more than 2 percent being reclaimed from aluminum-base scrap. The decrease in recovery from copper-base scrap resulted from the decreased use of that metal in brass and bronze products. The lower recovery from zinc-base scrap may be attributed to the low price for zinc, which experienced a greater drop in 1949, percentagewise, than the price of any other metal. Of the scrap consumed in 1949, 53 percent consisted of skimmings, flue dust and chemical residues—all low grade items that are not profitable to treat when the price of zinc is low. In 1948 the percentage was 58. As consumption of zinc scrap decreased 21 percent in 1949 and that of slab zinc only 15 percent, it is evident that many consumers found it more economical to use slab zinc than scrap. The steel strike caused some reduction in the quantity of zinc used for galvanizing but did not directly affect the consumption of scrap because little zinc scrap is used in galvanizing operations.

Iron and Steel Scrap

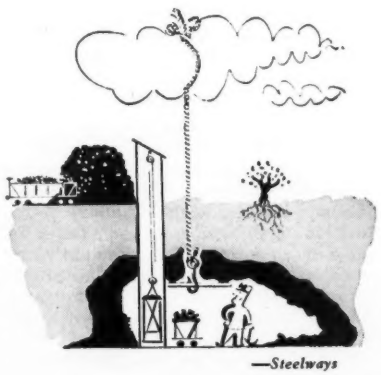
Purchases of ferrous scrap in 1949 fell behind consumption and consumers' inventories decreased each month from January to September, a reversal of the trends during the previous year. Inventories, which reached a ten-month low (2,404,000 gross tons) in January 1948, had increased every month for a year to a high point of 4,058,000 tons in January 1949. At that time the market prices for scrap were at a near all-time high of $43 per gross ton based on the composite scrap prices published by *Iron Age*. This high price, together with high consumer-inventories and the prospect of decreased steel demands, caused consumers to reduce their buying programs sharply. The effect on the price of scrap was immediate, and it dropped to near disastrous levels for a large number of scrap dealers. A low in the composite price of iron and steel scrap was reached on June 28, amounting to only $19.33 per gross ton. This price appeared particularly low when compared with that of pig iron which remained above $45 per ton during all of 1949. The drop in consumers' inventories from 4,058,000 tons in January to 2,940,000 tons in September was accompanied by a somewhat similar trend in the use of purchased scrap, which dropped from 2,539,000 tons in January to 1,762,000 tons in September. During the steel strike in October, when consumption of purchased scrap amounted to only 803,000 tons, inventories rose nine percent to 3,217,000 tons. The price of scrap during the closing months of the year was unsteady and closed at $26.58 per ton at year's end. Market conditions in the scrap industry in 1949 permitted substantial increases in stocks in the hands of dealers and automobile wreckers. These stocks increased during the year from a low of 139,647 tons at the end of February to 340,043 tons at the end of October. Although data are not available at this writing, stocks were undoubtedly considerably higher by the end of the year.

The consumption of iron and steel scrap and pig iron by months (partly estimated) during 1949 is given in an accompanying table. The use of all these materials was less in 1949 than in 1948 by the following percentages: Purchased 24 percent, home 10 percent, and pig iron 12 percent. Thus, the ferrous materials consumed in 1949 totaled 95,088,000 gross tons, the lowest since 1940. Of this total, it is estimated that 76,159,000 tons were consumed in steel-making furnaces, a 14 percent decrease from 1948. The balance of the total charge was consumed in iron-making furnaces, principally the cupola. This consumption totaled 18,929,000 tons, a decrease of 2,173,000 tons but a relative increase when compared with steel furnace use; iron furnaces used 20 percent of the total purchased scrap consumed compared with 19 percent in 1948.

Imports of iron and steel scrap in 1949 were larger than in any year since 1923 and totaled 974,440 gross tons during the first 10 months of the year. Nearly half of this total originated in Germany; most of the German scrap was received during the first quarter. Shipments from Germany to the United States virtually ceased after May 1949; the drop in the United States price of iron and steel scrap, together with increased European requirements, caused this marked decline in German shipments. Other leading suppliers of scrap to the United States during the first ten months of the year were the Netherlands, which supplied 19 percent of the total, and Japan, with 18 percent. Relatively small tonnages were obtained from Australia, Canada, Canal Zone, Cuba, Denmark, French Morocco, Republic of the Philippines, Union of South Africa and numerous other suppliers of small tonnages.

ESTIMATED CONSUMPTION OF IRON AND STEEL SCRAP AND PIG IRON, JANUARY THROUGH DECEMBER 1949, IN GROSS TONS

Month	Purchased	Home	Total	Pig iron
January	2,539,000	2,603,000	5,142,000	5,009,000
February	2,400,000	2,373,000	4,773,000	4,585,000
March	2,633,000	2,657,000	5,290,000	5,153,000
April	2,233,000	2,430,000	4,663,000	4,827,000
May	2,008,000	2,428,000	4,436,000	4,723,000
June	1,695,000	2,232,000	3,927,000	4,083,000
July	1,392,000	2,001,000	3,393,000	3,620,000
August	1,794,000	2,453,000	4,247,000	4,111,000
September	1,762,000	2,373,000	4,135,000	4,013,000
October	803,000	683,000	1,486,000	672,000
November	1,100,000	1,400,000	2,500,000	2,200,000
December	1,800,000	2,300,000	4,100,000	4,000,000
Total	22,159,000	25,933,000	48,092,000	46,996,000



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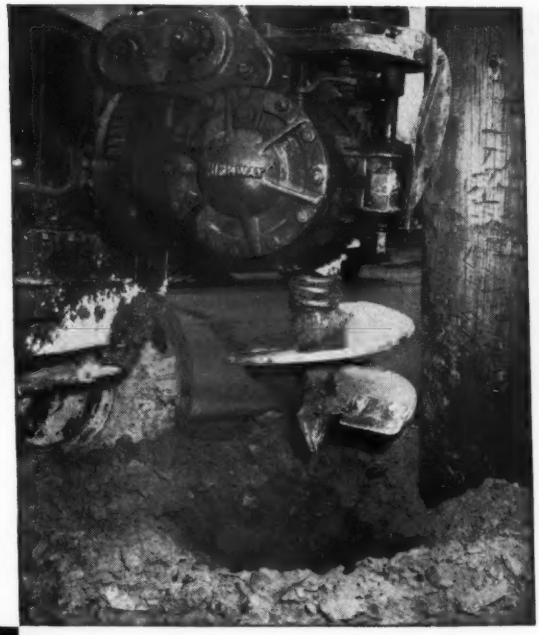

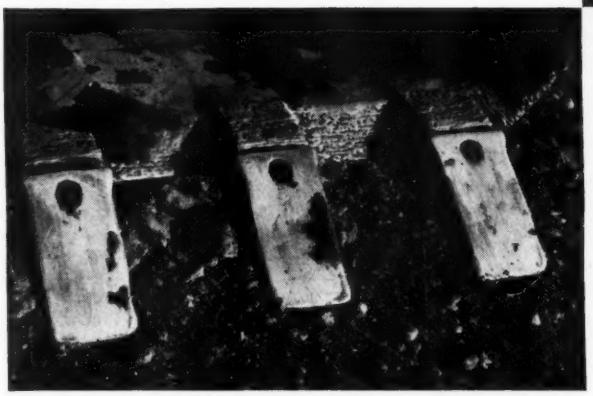

Post Hole Digger now digs 206 holes in rocky soil before repointing

Just 4 holes was the former life of a new point and blade on this power-driven post hole digger. After hardfacing with AMSCO Tube Tungsite, the same blade and point dug 206 holes—*51 times the former service!*

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Coal mining men from all producing states convene in Cincinnati

1950 Coal Convention

Sessions Will Highlight Coal's Progress

DESPITE all its difficulties, the coal industry made notable progress during the past year. The 1950 Coal Convention of the American Mining Congress at the Netherland Plaza Hotel, Cincinnati, April 24-26, will bring coal mining men a record of these accomplishments and a forecast of the future trends they indicate. Curtailed working time and frequent stoppages have imposed severe handicaps; nevertheless real technological advances have been made in the mining and preparation of coal as well as in the manufacture of equipment.

Serving as a focal point for the interest of the entire coal industry, the 1950 Annual Coal Convention program is planned to meet the needs of operators and manufacturers in both deep and strip mining. The attendance is a true cross-section of the administrative, technical and supervisory personnel; executives, managers, engineers, superintendents, foremen, chemists, electricians and repairmen. Your Program Committee has been hard at work to arrange a program of maximum value and interest to this wide representation. In the selection of the topics to be considered in covering the complete scale of underground and surface operations, the many suggestions received from the industry have been of material aid.

In addition to the papers and discussions selected for their specific appeal to the men charged with the responsibility of coal production, there are a number of papers of wide general interest. These economic questions will be discussed to perhaps a greater extent than at the conventions of previous years.

An over-all view of the arrangement of the sessions appears in the preliminary program on the facing page. Announcements to be made later will include brief outlines of the scope of the papers and discussions.

Special attention is called to two sessions where topics of unusual interest are scheduled. On Monday morning, an address on Improved Public Relations will focus thought on a topic that merits serious consideration. Although good work along this line has been done by agencies and associations, individual companies can accomplish additional progress towards building up, in their own communities and markets, a better understanding of coal's place in our national economy. On Wednesday morning, there will be addresses by men of recognized authority from without the coal industry, who will discuss the vitally important matter of pension plans for company employes. The industry is face to face with this question and can profit by all possible and counsel.

Lively Entertainment

Special luncheon meetings on the first two days of the convention will, in addition to good "vittles," feature outstanding speakers with timely messages on subjects of wide current interest. At the Monday luncheon, S. M. Cassidy, president, Consolidation Coal Co. (Ky.) and Chairman of the Coal Division of the American Mining Congress will preside. The Tuesday luncheon will be presided over by M. L. McCormack, manager, Rock Drill Department, Ingersoll-Rand Co. and Chairman of the Manufacturers Division.

Monday evening will be the occasion of the Coal Miners party, a time for fun and relaxation with fellow coal miners and their ladies. Good music, dancing and an exceptionally fine entertainment program will be on tap.

The Annual Banquet, top social function of the coal mining year, will be on Wednesday evening. This informal event will climax the activities of the busy days of the convention. Following a fine Netherland Plaza dinner, Toastmaster E. R. Price, manager of coal properties, Inland Steel Co., and Chairman of the National Program Committee, will briefly introduce honored guests. There will be no speakers; a floor show of top-notch talent will provide super entertainment. Tickets for luncheons and the Banquet may be ordered in advance.

A streamlined method of advance registration as adopted at the 1949 Coal Show will again be employed. Registration forms will be distributed throughout the industry—to both operators and manufacturers—early in March, requesting lists of those who will attend. Hand-lettered badges will be made up and forwarded early in April. Those who register in advance will eliminate any delays that might detract from the active time available at Cincinnati.

All room reservations are to be handled directly with the hotels. Those planning to attend should place their requests right away. Accommodations at Cincinnati are ample but prompt action is essential to get what you desire. If you wish help in getting accommodations, communicate with the Cincinnati Convention and Visitors Bureau, Inc., Dixie Terminal Bldg., Cincinnati 2, Ohio (telephone—Parkway 3728 or 5999).

Complete your plans now to attend this outstanding annual event of the coal mining industry. Mine production staffs and company executives will find the balanced program of the 1950 Coal Convention at Cincinnati of the deepest interest and importance in solving present-day problems. The program speaks for itself. Check the sessions you find of special interest, and place your request for registration and accommodations now and—we'll see you in Cincinnati.

Preliminary Program

MONDAY, APRIL 24

9:45 am—Opening Session

Improved Public Relations to Increase Coal's Market

A. C. SPURR, Monongahela Power Co.

Educational Programs to Develop Supervisors

H. C. LIVINGSTON, Union Pacific Coal Co.
H. L. WALKER, University of Illinois
G. R. SPINDLER, West Virginia University

12:15 pm—Luncheon

Speaker to be Announced

2:30 pm—Deep Mining Session

A Symposium on Roof Bolting—Principles and Practices

P. B. BUCKY, Columbia University
H. S. JAMISON, Delmont-Peerless Coal Co.
STERLING S. LANIER, JR., Norton Coal Corp.
D. E. INGERSOLL, Philadelphia and Reading Coal and Iron Co.
E. H. STEVENS, Tennessee Coal, Iron & R.R. Co.
DR. T. H. TROLLER, Joy Manufacturing Co.
EDWARD M. THOMAS, U. S. Bureau of Mines

2:30 pm—Strip Mining Session

Analysis of Power Requirements for Strip Operations

MAURICE QUINN, Sinclair Coal Co.

Grounding 440-Volt Circuits

L. E. BRISCOE, Ayrshire Collieries Corp.

Seismic Effect of Heavy Overburden Blasting

L. DON LEET, Harvard Seismograph Station

Radio Communications for Strip Mining

L. W. BARCO, United Electric Coal Cos.

TUESDAY, APRIL 25

9:30 am—Coal Preparation Session

Drying Fine Coal—Mechanical and Heat Methods

F. P. CALHOUN, Rochester & Pittsburgh Coal Co.
F. R. BUCKLEY, West Kentucky Coal Co.
GEORGE LAND, West Kentucky Coal Co.
L. O. LOUGEE, George S. Baton & Co.
F. C. MENK, Island Creek Coal Co.
W. T. TURBALL, Lehigh Navigation Coal Co.
R. L. SUTHERLAND, Truax-Traer Coal Co.

9:30 am—Mine Safety Session

A Panel Discussion on Methods to Reduce Mine Accidents

J. J. FORBES, U. S. Bureau of Mines
ROBERT J. HOWELL, Glen Alden Coal Co.
A. D. SISK, Kentucky Department of Mines
C. R. STAHL, Eastern Gas & Fuel Associates
RALPH WHITMAN, Ingle Coal Corp.

12:15 pm—Luncheon

Address by

L. B. SELTZER, Editor, *The Cleveland Press.*

2:30 pm—Deep Mining Session

Power Controls for Belt Conveyors

GEORGE T. ATKINS, Barnes & Tucker Co.
W. F. ROBERTS, Jeffrey Manufacturing Co.

Use of AC Power for All Underground Operations

J. O. CREE, West Virginia Engineering Co.
DAVID STOETZEL, General Electric Co.

Modern Mine Haulage with Belts and Tracks

C. W. THOMPSON, Weirton Coal Co.
GEORGE F. LEATHERMAN, Inland Steel Co.

2:30 pm—Deep Mining Session

Results of Time Studies to Improve Operating Efficiency

(a) Face Preparatory—
JOHN K. BERRY, Consolidation Coal Co. (Ky.)
(b) Mechanical Loading—
P. R. PAULICK, Consulting Engineer.
(c) Service Haulage—
A. W. ASMAN, Pennsylvania State College

Maintenance of Mining Equipment

GEORGE L. JUDY, Consolidation Coal Co. (W. Va.)

2:30 pm—Strip Mining Session

Use of Voltages Higher than 4000 for Large Equipment

J. E. BORLAND, Westinghouse Electric Corp.

Wheel Excavator for Overburden Removal

JOHN J. HUEY, United Electric Coal Cos.

Measurable Advantages of Outside Curves

LAFE STEWART, Maumee Collieries Co.
R. M. DICKEY, Bucyrus-Erie Co.

WEDNESDAY, APRIL 26

9:30 am—Pension Plans Session

Essentials of a Sound Pension Plan for Company Employes

J. W. MYERS, Standard Oil Co., Inc. (N. J.)
ROSCOE C. EDLUND, Fred Rudge, Inc.
JUDGE CHARLES I. DAWSON, Louisville, Ky.

9:30 am—Coal Preparation Session

European Trends in Coal Cleaning

JOHN GRIFFEN, McNally-Pittsburg Mfg. Corp.

Latest Developments and Trends in Coal Preparation

A. C. RICHARDSON, Battelle Memorial Institute

Preventing and Extinguishing Fires in Surface Refuse

(a) Bituminous—
HENRY F. HEBLEY, Pittsburgh Consolidation Coal Co.
(b) Anthracite—
E. T. POWELL, Susquehanna Collieries Division, The M. A. Hanna Co.

2:00 pm—Continuous Mining Session

A Symposium on Present Developments in Continuous Mining

GERALD VON STROH, Bituminous Coal Research, Inc.
WILLIAM E. HESS, Jones & Laughlin Steel Corp.
W. J. PHILLIPS, Sunnyhill Coal Co.
M. F. CUNNINGHAM, Goodman Manufacturing Co.
R. M. HUNTER, Rochester & Pittsburgh Coal Co.
C. E. HUGUS, JR., Reliance Electric & Engr. Co.
STEPHEN KRICKOVIC, Eastern Gas and Fuel Associates.

6:30 pm—ANNUAL BANQUET

It's EASY to install "Payroll Savings"

If you've put off installing the Payroll Savings Plan in your company because you feel it would be "a lot of work," then this advertisement is certainly for you! Because it's really *very simple* to give your employees the advantages of investing in U. S. Savings Bonds the easy, automatic "Payroll" way.

. . . and 20,000 companies' experience proves it pays!

HERE'S ALL YOU NEED TO DO

Appoint one of your top executives as Savings Bond Officer. Tell him to get in touch with your State Director, Savings Bonds Division, U. S. Treasury Department. Here's what happens . . .

The State Director will provide application cards for your employees to sign—plus as much promotional material and personal help as necessary to get the Plan rolling in your company.

Those employees who want Savings Bonds indicate on the applications: how much to save from their pay; what denomination of Bonds they want; and the inscription information to appear on the Bonds.

Your payroll department arranges to withhold the specified amounts, arranges to get the Bonds, and delivers them to the employees with their pay.

The Bonds may be obtained from almost any local bank or from the Federal Reserve Bank or may be issued by the company itself upon proper certification by the Federal Reserve Bank or Branch in the company's District.

THAT'S ALL THERE IS TO IT!

In case you're skeptical as to how many of your employees would like to have Payroll Savings, canvass your plant—and be prepared for a surprise. (Remember that pay-check withholdings for Bonds are *not* a "deduction"—the employee takes home his Bonds with his pay.) One leading manufacturer, who had professed little faith in the Plan, found his eyes opened when he asked the people in his plant whether they would like to obtain Bonds in this way. Within only six months after he installed the Plan, half his employees signed up. A prominent aircraft manufacturer, whose company had used the Plan for some time, was not aware of its potentialities until his personal sponsorship increased participation by 500% among his company's employees.

THE BENEFITS ARE BIG—FOR EVERYONE

The individual employees gain security—they know that the Bonds they hold will return $4 for every $3 at maturity. The company gains from the resultant increased stability and efficiency of its workers. The whole nation gains because Bond sales help stabilize our economy by spreading the national debt and by creating a huge backlog of purchasing power to boost business in the years ahead.

Is it *good policy* to deprive your company of Payroll Savings—even one more pay day? Better at least have a talk with your U. S. Savings Bonds State Director, get the answers to your questions, and *know for sure.*

The Treasury Department acknowledges with appreciation the publication of this message by

MINING CONGRESS JOURNAL

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Wheels of GOVERNMENT

AMC

As Viewed by A. W. DICKINSON of the American Mining Congress

ACTING on the blast contained in the President's tax message of January 23, Treasury Secretary John Snyder and his staff have attacked the depletion deductions of the oil and mining industries at hearings which began before the House Committee on Ways and Means February 3. Snyder advocated reduction of the present percentage depletion rates on oil, gas and sulphur to 15 percent and of the present 15 percent rate on nonmetallics to 5 percent. He suggested that the present rate of 15 percent on metal mines remain unchanged, and proposed no change in the present 5 percent rate for coal mines.

Following testimony by representatives of the oil and gas industry on February 8 and by representatives of the mining industry on February 9, the Ways and Means Committee will consider various other so-called "loopholes," corporate rates, estate and gift taxes and short-term capital gains. A week or more will be devoted to testimony on excise tax reductions.

Following the hearings the Committee, under Chairman Robert L. Doughton (Dem., N. C.), will write a revenue bill, there being no specific measure before the Committee at the present time.

The Tax Message

The White House tax message stressed reductions in wartime excise taxes, particularly those on transportation of property and persons, long-distance telephone and telegraph communications, and the retail excises. Increases were proposed in estate and gift taxes and on the corporate rate on income in excess of $50,000. Another recommendation would extend the loss carry-forward provision from two to five years.

Outstanding in seriousness to the mining industry was the attack made on the percentage depletion provisions of the law applying to mining and to oil production.

Those who drafted the message gave no recognition to the fact that the measure of depletion under the present law was carefully and fairly set by experience; and that the percentage method affords a simple, equitable means of computing the reasonable allowance for the exhaustion of a mineral deposit which has always been contemplated in the law. It recognizes that every ton of mineral is capital and that when taken from the deposit it is gone forever; that its value is a proper deduction from gross income in order that the income tax shall not be a levy on the capital of a mineral producer.

Percentage depletion provides a reasonable allowance for the return of capital in the year in which each ton of mineral is taken from the ground. It should be emphasized that present depletion allowances are not a "loophole" or a means of tax evasion, but an essential and long-recognized means of permitting the mine operator to recover, at least in part, the capital value of his mining property. It is also important to point out that percentage depletion is not a "tax bounty" but a proper deduction from income for the exhaustion of a wasting mineral asset; that the mining industry as a whole is not recovering more than its capital expenditures in prospecting and development of mines; and that any curtailment of existing depletion allowances would serve to dry up the source of funds for development of future reserves, thus reducing tax revenues from the mining industry and from those who derive their income therefrom.

NMA Council Recommendations

Bearing pointedly on our revenue laws as they apply to the mining industry are the current recommendations of the National Minerals Advisory Council to the Department of the Interior, as presented to the Senate by Senator Pat McCarran of Nevada on January 30. This report emphasizes that exploration and development of nonferrous and strategic metals deposits in the United States by individuals and smaller corporations have declined alarmingly. The Council declares its unqualified opinion that excessive taxation is a principal cause of the lack of interest in exploration for and development of new mineral reserves. It emphasizes that incentive for mining exploration, development, and operation comes from hope of a gain sufficient to warrant the risk, the effort and the investment involved and that if possible gains are too greatly impaired by taxation, or if gains are taxed without full allowance for losses, there can be little incentive for new exploration, development and investment.

The Council's recommendations point out necessary changes in the revenue laws and their administration as follows:

(1) Allowance for depletion should be made to the stockholder as well as to the corporation.

Washington Highlights

CONGRESS: In full swing.

TAX MESSAGE: Calls for more revenue.

PERCENTAGE DEPLETION: Again attacked.

NMA COUNCIL: Would ease mine taxes.

SOCIAL SECURITY: Hearings proceeding.

LABOR MONOPOLY: Senate Judiciary considers.

COAL STRIKE: Mines idle again.

DELIVERED PRICING: Compromise planned.

Distributions to stockholders should be considered to represent depletion to the same extent that depletion is allowed against income to the corporation.

(2) Tax exemption should be granted to a mine for a period of at least three years after beginning of profitable operations.

Such an example would be most important in stimulating new development and discovery, as it has in Canada.

(3) Development costs after discovery should be recognized as operating expenses.

Such development costs should not be treated as capital expenditures. Their nature and purpose is for operation of and production from the known deposit. The taxpayer should have option to charge them off currently or to treat them as operating costs when the ore related to such expenditures shall be mined.

(4) Adequate allowances for percentage depletion should be made.

The present percentage of gross income and the present limitations in reference to net income for mines should both be increased.

(5) Losses from unprofitable ventures should be allowed corporations, partnerships or individuals as ordinary deduction against current income.

When a mine is abandoned or becomes unprofitable or when exploration or development work has not proven the existence of a profitable mineral deposit, the loss should be allowed in full as a deduction from income.

(6) Income should not be taxed without full allowance for losses of loss years.

A carry-back for two years and a carry-forward of five years should be allowed. Depletion and other deductions and credits should be allowed as if the loss year and the income year were a single taxable period.

Senator McCarran emphasized that "it is the small operator who risks his life savings to drive a shaft in which he gambles the future of himself and his family that the President's attack on depletion would hit."

Social Security

Hearings which are expected to run on through the month of March began before the Senate Finance Committee January 17 on the House-passed Social Security bill, H. R. 6000, discussed in the January JOURNAL. Social Security Commissioner Arthur J. Altmeyer urged the Committee to approve H. R. 6000 in its present form, but made the further request that the payroll tax be collected on the first $4800 of income instead of the $3600 specified in the pending bill. Senators Millikin of Colorado and Taft of Ohio sharply attacked the Administration Social Security program as a gratuitous system paid for by passing the tax along to the public. Millikin charged that use of Social Security reserves to meet current Government expenditures results in a demand upon the taxpayers to "pay for this twice."

Led by Robert M. Searls of San Francisco, American Mining Congress witnesses from California, Colorado, Arizona, Idaho, Montana and Utah will present testimony to the Finance Committee in early March, urging amendment of H. R. 6000 to protect independent contractors ("block-leasers") in their long established rights. It is also understood that many block-leasers have asked for time to appear and present their viewpoint to the Committee.

Labor Monopoly

A Senate Judiciary subcommittee will open hearings February 14 on a bill introduced by Senator A. Willis Robertson (Dem., Va.) to make the anti-trust laws apply to labor unions where: (1) a union acts in "unreasonable" restraint of trade, and (2) such union action affects an industry essential to the national economy, health or safety, or any substantial segment thereof. The serious question of monopolistic practices by labor unions was the subject of extended hearings before the Senate Committee on Banking and Currency last July and August.

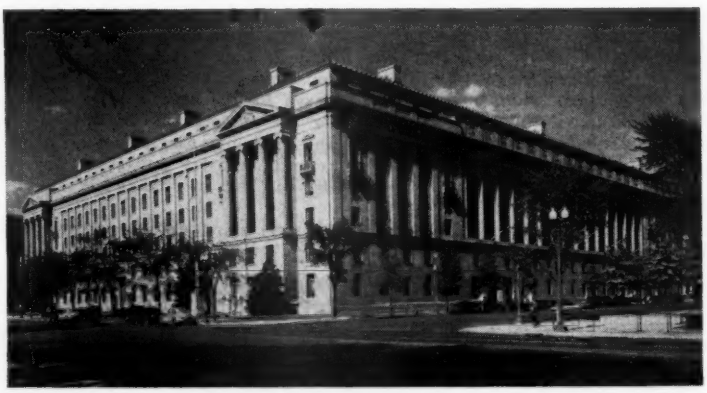
In bringing his bill to the attention of the Senate, Robertson explained that Congress had always intended that labor unions should be subject to the anti-trust laws, but that the Supreme Court, in a case decided in 1941, had held otherwise. Senator Robertson contends that his bill would overrule this decision of the Court.

Citing the present emergency in coal, Robertson declared that labor leaders and labor unions today have the power of unreasonably restraining trade to any extent their whims dictate, including controlled production and prices, by unlawful means as well as lawful means. He said that "Unions are now secure and safe in the realization that the immunizing Acts which Congress has passed, coupled with the interpretation which the Supreme Court has given to those Acts, make all labor and pseudo-labor activities safe from any corrective action by any court of the United States."

Previous to the introduction of the Robertson bill, the Senate Committee on Banking and Currency on January 10 rendered a report to the Judiciary Committee that contained the query: "What then can be done to curb the power of labor organizations which are left free, under the anti-trust laws as judicially interpreted, to upset the banking and credit structures of the country, regiment industry under production and price controls, raise consumer prices at will, affect adversely national stabilization, and drive small-business enterprise out of the national economy or allow it an estate by sufferance at the whim and caprice of a labor organization? Surely, our forefathers have not left the Congress defenseless in the face of such an unexpected development."

Coal Strike

Although contract negotiations between the bituminous coal operators and the UMWA were resumed in Washington February 1, the nation is now faced with a general strike at the mines. The negotiations quickly collapsed and the President has invoked the national emergency provisions of the Taft-Hartley Act. The Board of Inquiry appointed under the Act consists of David L. Cole, Paterson, N. J., lawyer, Chairman; W. Willard Wirtz, Northwestern University professor; and John Dunlop, Howard University professor. The Board is



Department of Justice

instructed to report by February 9, and thereafter the President may seek a court order directing the miners to return to work for 80 days.

Delivered Pricing

Last fall the Senate agreed to vote January 20 on the Senate-House conferees report on S. 1008, the Delivered Pricing Bill. When the vote was taken this measure, legalizing freight absorption, was disapproved and the House was asked to appoint new conferees. Reportedly this action was taken to avoid a White House veto. The Department of Justice has advised Congress that it will not object to the present form of the legislation, if the bill is amended so that the burden of proof in certain anti-trust cases will not be placed upon the prosecuting agency. Further recommendations by the House Judiciary Committee have been deferred pending the results of work now being done to effect a compromise.

Stock-Piling

(*Continued from page* 68)

the stock pile. It is, to be sure, a physical reserve of materials owned by the Government and stored in Government depots. It is also an inventory of raw materials with a cash value—a sort of insurance policy. Third, it is a national security program, part of the whole spectrum of provisions for defense and industrial mobilization in time of war. Fourth, the stock pile is a vast pool of manpower and time; it is the manpower and time required to accumulate the stock pile, but more importantly, it is the tremendous amount of manpower *that would be required in wartime were there no stock pile.*

Repeatedly the attention of the military establishment is called to processes and bits of design used by other nations in World War II to eliminate the need for some strategic material. Few of these ingenious devices were used in the United States, not because we were behind-times but rather because these devices saved materials by spending manpower. Traditionally the view in the United States has been that manpower should be saved through expenditure of materials; the reverse view is held in Europe. Of course, each is a half-truth. Materials and manpower are both a part of the national resources and the aim of our technology should be to achieve a balance in which all our resources and manpower are fully, efficiently and effectively used in combination.

Thus, the stock pile of strategic and critical materials should be considered a "residual" solution to supplement other efforts to strengthen the national security. As manpower is the ultimate resource of war, attention should be given to all ways to *reduce* manpower needed for essential war production programs, and to *increase* the amount of manpower and time contained in our industrial reserves. We are now building Government stock piles not only of strategic materials, but also of war plants, machine tools, and even some items of equipment. As we expand these stock piles, we should bear in mind the impact of these programs on our entire national portfolio of resources. Prudent national policy requires a husbanding of the resources of Government credit, for example. Then, too, the national resource of manpower should not be dissipated in inefficient production, but rather should be put to work at highly productive jobs. And finally, our resources of time—a highly perishable resource—can be stock-piled only with difficulty. If we waste this resource of time now, we may be obliged to trade not only materials and man-hours, but even lives to buy time during some future emergency.

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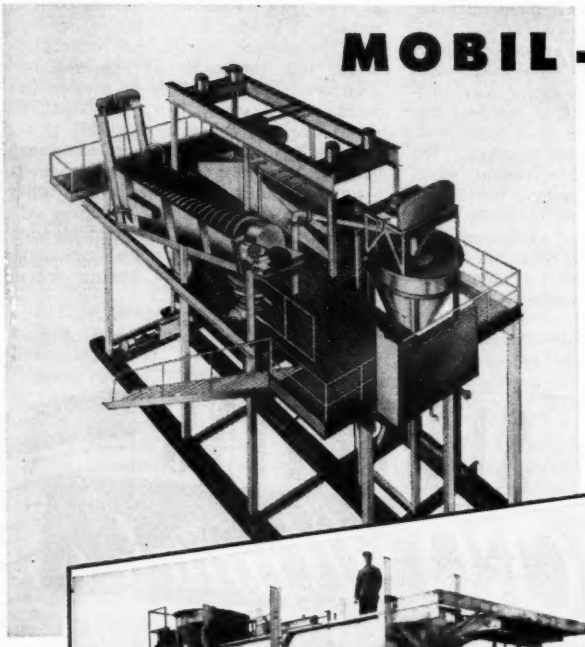

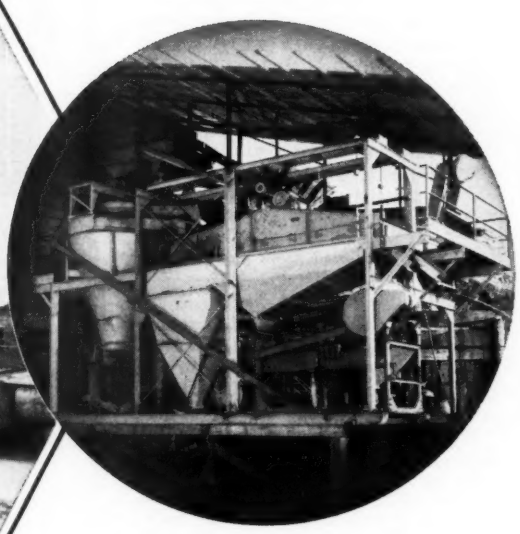

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AMC Personals

Robert C. Norton was recently elected chairman of the board of Oglebay, Norton & Co. to succeed the late Crispin Oglebay. **Alfred M. Rankin** was elected a director of the company.

James Wilson has been promoted to the position of mining engineer at the Clover Splint mine of the Consolidation Coal Co. (Ky.)

Ernest Thurlow, geologist for the Atomic Energy Commission, has opened an office in Spokane, Wash., with space in the quarters of the U. S. Geological Survey.

Dr. John W. Vanderwilt, well known consulting geologist of Denver, has been named president of the Colorado School of Mines to succeed **Dr. Ben H. Parker**, who has resigned effective April 1.

Dr. Vanderwilt was formerly on the faculty of the Colorado School of Mines as well as on that of the University of Colorado. He is presently a member of the board of trustees of the Colorado School of Mines, from which position he has resigned effective March 20. In his new post, he will retain some of his consulting work in the field of mining and engineering geology, thereby continuing his professional contacts with the mineral industry.

Rollin J. Kennard, mechanical superintendent of the Great Falls Reduction Works, has been named chief engineer of the electrical and mechanical departments of the Montana and Idaho operations of the Anaconda Copper Mining Co., succeeding the late C. D. Woodward. He has been associated with the company since 1914.

Paul Gill is now chief mining engineer for the Clearfield Bituminous Coal Corp.

Leo A. Kraemer, formerly superintendent of the By-Product Coke Division of the Pittsburgh Steel Co., has been named operations engineer for the Engineering and Construction Division of Koppers Coal Co., Inc.

A. J. McNab recently succeeded **Charles F. Ayer**, resigned, as president of Magma Copper Co.

Robert W. Whitaker has been elected vice-president and general manager of the Anchor Coal Co., with headquarters in Cleveland.

Charles J. Hutchinson, El Paso, Tex., was elected president of the Rocky Mountain Federation of Mineral Societies at the group's annual convention.

W. J. Magee, vice-president of the Carbon Fuel Co. and Carbon Fuel Sales Co., retired recently, after being identified with the coal industry for more than 50 years.

Dr. Wendell P. Woodring, geologist, U. S. Geological Survey, has been awarded the Penrose Medal of the Geological Society of America "for distinguished achievement in the geologic sciences."

L. J. Timms is now assistant to the president of Premier Pocahontas Collieries Co. and the Eastern Coal Corp. Prior to his present position, he was general superintendent of the Ebensburg Coal Co., Colver, Pa.

George M. Humphrey, president of the M. A. Hanna Co., was elected president of the Iron Ore Co. of Canada. This company was formed for developing iron ore concessions held by Labrador Mining & Explorations Co., Ltd., and Hollinger North Shore Exploration Co., Ltd.

Vernon F. Daughney has joined the staff of the mineral dressing laboratory of the American Cyanamid Co. as a senior mineral dressing engineer at Stamford, Conn. Previously, Mr. Daughney worked for several mining companies in Canada as mill superintendent, metallurgist and consultant.

A. J. Herzig has been elected president of Climax Molybdenum Co. of Michigan, research subsidiary of Climax Molybdenum Co. Mr. Herzig joined Climax as chief metallurgist in 1931, after serving as research associate at the University of Michigan.

The Kentucky Mining Institute has elected **Davis Read** as president; **J. B. Marcum** as first vice-president; **F. P. Kerr**, second vice-president; **L. P. Johnson**, third vice-president, and **A. D. Sisk**, secretary-treasurer.

Charles R. Cox has resigned as president of Carnegie-Illinois Steel Corp., a subsidiary of the United States Steel, to become president of Kennecott Copper Corp. **Clifford F. Hood**, president, American Steel & Wire Co., also a United States Steel subsidiary, has been elected president of Carnegie-Illinois Steel Corp.

Joseph Shannon of Herrin, Ill., has been appointed to the Illinois Coal Products Commission. He succeeds Joseph Marcheis.

J. P. Skinner has been transferred from Franklin, N. J. by the New Jersey Zinc Co. to the Eagle mine in Gilman, Colo. as assistant mine foreman.

Stuyvesant Peabody, Jr., president, Peabody Coal Co., has been elected a member of the executive board of the Illinois Coal Operators Association. He succeeds **D. H. Devonald**, vice-president, Peabody Coal Co., who resigned. **T. G. Gerow**, executive vice-president, Truax-Traer Coal Co., who became president of the association in September, will head the group during the coming year. **R. E. Snoberger**, president, Binkley Coal Co., was elected to a full-year term on the executive board. Other officers and board members were re-elected.

Lawrence Petersen has been promoted to the post of general traffic manager of Eastern Gas and Fuel Associates. He succeeds **Howard M. Waybright**, retired.

Raymond H. Feierbend is now superintendent of production for Freeport Sulphur Co. at its Grande Ecaille, La., mine.

At the annual meeting of the directors of the Utah Mining Association, **Paul H. Hunt**, president and general manager, Park Utah Consolidated Mines Co., was elected president, succeeding **W. H. H. Cranmer. A. G. Mackenzie** was reelected vice-president. New second vice-president is **W. C. Page**, recently appointed general manager of western operations, U. S. Smelting Refining and Mining Co. **R. D. Bradford**, general manager, Utah department, American Smelting and Refining Co., was elected third vice-president. New directors include **Mr. Bradford, A. G. Kirkland**, manager of mines, U. S. Smelting Refining and Mining Co., **H. E. Raddatz**, president, Tintic Standard Mining Co., and **Cecil Fitch, Jr.**, director, Chief Consolidated Mining Co. **James K. Richardson** was reelected association manager.

James Hyslop was recently promoted from executive vice-president of the Hanna Coal Co. to president of the company. He replaces **R. L. Ireland** who has been president for a number of years but who will continue in executive management of the Hanna company as director and chairman of the executive committee. Mr. Hyslop will continue to maintain his offices in St. Clairsville, Ohio.

V. S. Barlow, general mine foreman at Kennecott Copper Corp.'s Utah Copper Division, was recently advanced to assistant mine superintendent; **Ernest C. Simkins**, general hill foreman is now general mine foreman; **Richard H. Willey**, first assistant drilling and blasting foreman was advanced to general hill foreman and **M. A. Moffat**, assistant chief accountant, became employment director at the mills department. Retired were **J. E. Cavanee**, engines road foreman in the ore hauling department and **Wm. J. Hicks**, employment director, mills department.

Everett H. LaRue has been named general manager of sales by the Princess Elkhorn Sales Co. He succeeds **H. B. Mondey**, who has resigned to start his own business.

John K. Gustafson, on completion of a two-year period during which he agreed to serve as manager of the Atomic Energy Commission's Raw Materials Operations Office, has become consulting geologist for the M. A. Hanna Co.

George A. Tweedy has joined the staff of the U. S. Bureau of Mines in the southwestern Wisconsin zinc district with headquarters at Platteville, Wis.

Edward Hibline, Jr., was elected for the third consecutive term as president of the Maryland Coal Association. **Henry Page** was elected vice-president.

Alfonso H. Tuttle, of Helena, Mont., who has served for the past 11 years as district engineer in charge of surface water investigations for the U. S. Geological Survey has retired. He is succeeded by **Frank Stermitz.**

Leroy Traeger has become manager of the Conda, Idaho, phosphate operations of the Anaconda Copper Mining Co.

L. L. Lewis has been elected secretary and director of Carnegie-Illinois Steel Corp. and **C. E. Stewart** as assistant secretary according to a recent announcement by C. R. Cox, president of the U. S. Steel subsidiary.

Ernest R. Rodriguez has been assigned to duty with the safety branch of the U. S. Bureau of Mines at Phoenix, Ariz.

— *Obituaries* —

Dr. George S. Rice, 83, who pioneered the study of the cause and prevention of coal mine explosions, died recently, after a long illness. Veteran of nearly 30 years' service in the U. S. Bureau of Mines, Dr. Rice was its chief mining engineer and led experiments which ended in the discovery that some mine explosions are due to dust, rather than gas, as had been supposed. He also was instrumental in developing a ventilation system for the Holland Tunnel under the Hudson River.

Raymond G. Lawry, 70, associated with Roberts and Schaefer Co. for the past 40 years, died recently. He was instrumental in the development of equipment for the coal mining industry of the Midwest.

John W. Houser, 67, died recently in Knoxville, Tenn. He was vice-president and general manager of Tennessee Copper Co.

Walter C. Burchett, 82, of Spokane, Wash., passed away recently. He was discoverer of the famous Sullivan mine, now owned by the Consolidated Mining and Smelting Co.

Herman Schifflin, 81, who retired in 1942 as manager of the crusher, cement and mining machinery department at Allis-Chalmers Manufacturing Co., died recently.

James E. Ash, 57, secretary-treasurer of the Coal Producers' Association of Washington, died recently in Seattle.

A. M. Hartford, veteran Alaska mining engineer, died recently. Mr. Hartford was associated with the United States Smelting Refining & Mining Co. in Alaska for 27 years. For the past 12 years he had been manager of the company's Nome operations.

Justin C. Trader, 65, president of Low Moisture Coal Co., died recently. He also had served as president of Flat Creek Coal Co., Wynn Coal Co., and Harmon Creek Coal Co. From 1917 until the time of his death, Mr. Trader was active in the western Kentucky coal field.

Selden S. Rodgers, 64, superintendent of the Anaconda Copper mining reduction works in Anaconda, Mont., died recently after a long illness. He was considered one of the nation's authorities on ore dressing.

David J. Rohrer, 76, vice-president of The Four Wheel Drive Auto Co., died recently. He had been a director of the company since its organization in 1910.

Josiah E. Spurr, 80, widely known mining engineer and geologist, died recently at his home in Winter Park, Fla. Mr. Spurr served as consultant to the Sultan of Turkey from 1901-1902, and thereafter was geologist with the USGS until 1906.

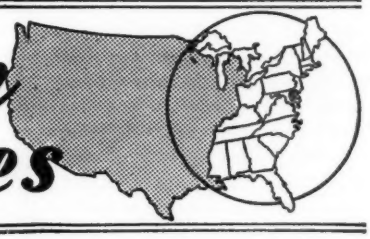
Later he became chief of the geology department of the American Smelting & Refining Co., the Guggenheim Exploration Co. and other organizations. In World War I he was with the Shipping and War Trade Boards. After the war he served as editor of *Engineering and Mining Journal*. He was co-author with F. E. Wormser of "The Marketing of Metals and Minerals."

Harvey L. Garrity, 48, recently named general superintendent of operations for the Utah Division of Kennecott Copper Corp. died on January 11.

He had been with Kennecott organization since 1923 where he first worked on an Alaskan survey crew. In 1925 he was named safety engineer at the Bingham mine. He became general track foreman in 1930.

NEWS and VIEWS

Eastern States



Tralee Mine in Operation

Early in February the Semet-Solvay Division, Allied Chemical & Dye Corp., placed its new Tralee Mine in operation. The mine, located on the Virginian Railway in Wyoming County, W. Va., works the No. 3 Pocahontas seam. Modern mining machinery is installed and it is expected that the mine will be brought to full production during the year.

Buffalo Creek Preparation Plant

At Dawson Springs, Ky., the United Electric Coal Cos., has begun operation of the new Buffalo Creek preparation plant. Four sizes of West Kentucky No. 6 coal are produced in a plant which is equipped with an oil-treating system. Fine sizes of coal are dried in two centrifugal driers. Most of the equipment for the 350-ton per day plant was fabricated at the mine.

Roof Bolting Permits

West Virginia mines desiring to use or experiment with roof bolting are required to obtain permits from the West Virginia Department of Mines. This ruling, effective December 1, 1949, was explained in the department's semi-annual report which stated that more than 50 experiments were in progress in the state. "Although there have been no serious accidents some of the trials are reported to be meeting with quite a measure of success." The report adds, "They present a new and very serious problem to the Department of Mines.

"The policy of the Department of Mines must be directed to encourage progress. It shall not be directed to discourage orderly experiments that may develop the means of saving lives of the countless number of coal miners. However, the inspector must see that the trials are carried out in a systematic manner, employing every precaution against failures and accidents.

"It is necessary that the Department acquire certain information necessary to the exercise of the measure of control over these experiments in order to avoid failures, to prevent installations considered dangerous, and to provide records upon which to base further recommendations and advice. . . ."

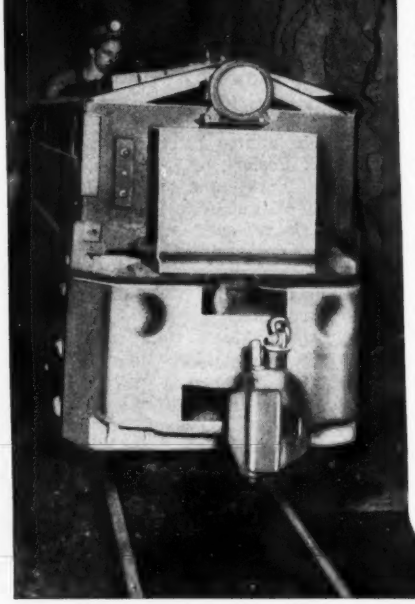
Underground Power Plants

At the annual meeting of the American Society of Civil Engineers in New York, Joseph D. Lewin, Board of Water Supply engineer of New York reported that since the Buchbergmuehle plant in Germany was placed in operation in 1907, the rapid development of underground power houses all over the world seems to indicate, not only their basic economic feasibility, but their operational advantages.

Plants have been built all over the world and in all types of rock ranging from hard, sound rocks like the granites of Sweden, requiring practically no support, to badly fissured

At Morgantown, W. Va., the Dravo Corp., Pittsburgh, is constructing this new lock and dam on the Monongahela River. This project is one link in a chain of river improvements designed to increase coal trade between Fairmont and points north

How to keep them ON THE GO!



SHREWD MINE operators know that bogged-down locomotives, trammers or shuttle cars bring on blocked right-of-ways, snarled schedules and upped production costs.

They always keep this in mind when buying haulage batteries. Many have found that it is well worth the small extra premium to obtain the long life and dependability of rugged EDISON Batteries. EDISON cells are built of steel inside and out . . . they take temperature extremes, jars, jolts and accidents as part of the day's routine. Case histories show that many of them have fallen down shafts or been in fires or floods . . . and are still hard at work today!

EDISON Batteries are not injured by accidental short-circuiting or reverse charging, and can be charged direct from d-c lines in 6 to 7 hours without critical rate regulation. During shutdowns they can be stored indefinitely with no attention.

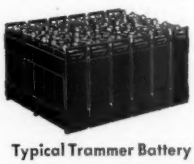
Write today for full information and a current price quotation. You'll find EDISON Batteries cost little more than other makes of batteries . . . and they pay this back over and over in terms of low upkeep and long, long life.

Edison Storage Battery Division of Thomas A. Edison, Incorporated, West Orange, New Jersey. In Canada, International Equipment Company, Ltd., Montreal and Toronto.

EDISON

Nickel · Iron · Alkaline

STORAGE BATTERIES



Typical Trammer Battery

rocks requiring substantial and nearly continuous roof supports.

Mr. Lewin told the group that the majority of underground hydro plants were constructed before strategic bombing was developed during World War II. The original decision to place plants underground was primarily an economic one. An analysis shows that construction costs are as much as 40 percent less than conventional surface developments, most of the savings being due to shorter developments, elimination of penstocks and valves, and savings in tunnel linings.

The fact that underground developments are cheaper than surface developments can be attributed to economical methods of excavating rock used in Europe. In comparison to prevailing American labor costs, Mr. Lewin said that European tunneling methods reduce the cost of rock excavation by as much as 60 percent.

By using light, high speed rock drills which weigh 35 to 55 lb and special drill steel, light drilling platforms, excavation is speeded up. Holes of 1 5/16 in. diam are drilled with steel tipped with non-detachable tungsten-carbide chisel-shaped bits that are resharpened by grinding to extend their useful life.

Itmann Mine Reopened

Early in January the Pocahontas Fuel Co., Inc. reopened its Itmann mine, Mullens, W. Va. Work to connect the old part of the mine with a new portal was planned to be undertaken at an early date and construction of a new tipple and preparation plant is reported to be under way. For 21 years the property has been closed down. Reserves are estimated at about 45,000,000 tons of Pocahontas No. 3 coal. The new plant will have a planned production of 1,000,000 tons annually.

Titanium Distributor

Allegheny Ludlum Steel Corp. and the National Lead Co. have formed the Titanium Metals Corp. of America, to distribute titanium metal and its alloys. Finished metals and alloys will be produced by National Lead and Allegheny Ludlum with "each company doing those operations for which it is best equipped," according to a joint statement by H. G. Batcheller, president of Allegheny Ludlum, and J. A. Martino, president of National Lead.

Officers of the new company are president, H. C. Wildner, who is also vice-president of National Lead; vice-president, Clark W. King, who is vice-president of Allegheny Ludlum; secretary-treasurer, A. H. Drewes, who is assistant to the president of National Lead.

Sweden Gets ECA Funds

A Marshall Plan industry loan to Sweden has been made with a maximum of $350,000, to enable the AB Zinkgruver Co. the opportunity of purchasing special mining equipment in the company's long-range program to expand operations in four zinc-lead-copper mines near Falum, Sweden. Repayment of the loan will be made in zinc or lead, to begin in 1952.

Allegheny Mine Leased

The Allegheny mine of the Hellier Coal & Coke Co., has been leased by the Kentucky Fuel Co., Hellier, Ky. Output of the mine will be handled by Tildesley Coal Co.

Saginaw Mine Reopened

In the Ohio No. 8 field, near St. Clairsville, Ohio, Oglebay, Norton & Co. has opened another coal mining property which will be known as the Saginaw. Shipments from the mine were made in mid-November. Reserves of Ohio No. 8 coal on the property are estimated at 20,000,000 tons.

Last summer the company drove a 16-deg slope for a lineal distance of 790 ft to the coal seam. Eventually daily tonnage will be increased to 4000 tons.

M. A. Williams is general superintendent of all mines managed and operated by Oglebay, Norton & Co. Richard Graham is superintendent of the Saginaw mine.

Safety Record Set

Pennsylvania coal miners set a new safety record in 1949. During the first 11 months of the year bituminous coal miners' record showed a 43 percent cut in fatalities against a 33 percent drop in production. Fatalities in the anthracite counties dropped 42 percent with a 23 percent drop in production.

Coal Mining Instruction

A committee, appointed by the West Virginia House of Delegates and Senate, met recently to discuss ways and means of promoting coal mining instruction in public schools. A need was expressed for safety instruction and for developing a favorable attitude on the part of the public with regard to coal mining. Attention was called to efforts in other states to promote mining education and to the fine results being obtained in Ohio and Indiana.

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● The self-propelled McCarthy makes blast holes close to the floor or bottom and it makes them fast!

Actual records show that for operations in shale, sandrock and soft limestone overburdens, these tough, mobile power units easily drill up to 1500 feet per day.

Operators like the compact McCarthy design . . . ideal for working confined areas. They like the four special, individual leveling jacks that make setups easier, and the smooth, steady way the hydraulic carriage moves forward, feeding 4, 6 and 8-inch diameter auger sections into the earth to depths of 100 feet or more.

Write today for the complete story on McCarthy Drills. There's bigger money waiting for you and McCarthy knows how you can get it faster. List of users on request.

DRILLING EQUIPMENT SINCE 1901

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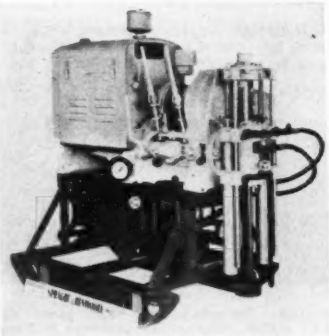
For "TOPS in Performance"—

Sprague AND *Henwood*

CORE DRILLING MACHINES and EQUIPMENT



S & H # 40-C Core Drill

S & H Core Drilling Machines spell maximum performance with low maintenance costs for every user. They are built to meet the exacting demands of present day core drilling requirements and can be depended upon to perform the work for which they are recommended.

Sprague & Henwood also manufacture a complete line of Core Drilling Equipment, including "TRUCAST" bortz diamond bits.

The success of a drilling program depends on the proper selection of sizes and types of equipment. Let us help you make this selection intelligently.

WRITE FOR FULL DETAILS TODAY

SPRAGUE & HENWOOD, INC. are also drilling contractors and are prepared to handle any of your drilling requirements on a contract basis.

SPRAGUE and HENWOOD, INC.

SCRANTON 2, PA.

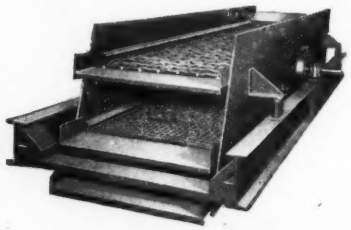
VIBRATING SCREENS CONVEYORS—FEEDERS SCALES—CRUSHERS CONVEYOR IDLERS

GUARANTEED EQUIPMENT—IMMEDIATE SHIPMENT

VIBRATING SCREENS

100 machines in stock: screen sizes 2' x 5' to 5' x 14'; 1 to 5 decks. Positive throw eccentric shaft types; also eccentric weight types.

Prices from $395.00

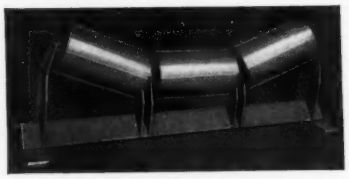


CONVEYORS—PICKING TABLES

Troughing idler conveyors—picking tables. Any length, belt widths to 60".

Prices from $395.00

TROUGHING IDLERS AND ROLLERS



All steel. Interchangeable with other well-known makes. Replaceable precision ball bearings. No bearing adjustments required. Easy to start and will run in cold weather. Rust-proof ball races; maintenance is negligible. Build your own conveyors; we have standard sections, head and tail pulleys, take-ups, drives, idlers, speed reducers, sheaves, belting, etc.

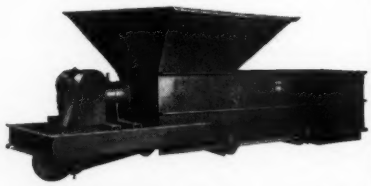
3-roll Troughing Idlers for these sizes:

14" belt.....	$18.50	24" belt.....	$21.00
16" belt.....	19.00	30" belt.....	22.00
18" belt.....	20.00	36" belt.....	23.00
42" belt.....	$24.00		

1-roll Returning Idlers for these sizes:

24" belt.....	$8.25	36" belt.....	$ 9.75
30" belt.....	9.00	42" belt.....	10.50
48" belt.....	$11.25		

HEAVY DUTY PLATE AND PAN FEEDERS



15 to 35 ton per hour capacity.....	$150.00
28 to 60 ton per hour capacity	190.00
50 to 100 ton per hour capacity.....	575.00
100 to 175 ton per hour capacity.....	800.00

TRUCK SCALES

15 Ton Truck Scales.....	$450.00
20 Ton Truck Scales.....	510.00
26 Ton Truck Scales.....	565.00

Others to 50 ton capacity. All truck scales complete with structural steel weighbridge.

More than 2,000 mines and quarries have Bonded equipment.

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Coal Lands Transferred

Transfer of more than 25,000 acres of coal lands from the Hanna Lands Co. to the M. A. Hanna Co. of Cleveland and to Pittsburgh Consolidation Coal Co. has been recorded at Steubenville, Ohio. The transfer is reported to be part of reorganization plans among the three firms. The 25,000 acres are the entire holdings of the Hanna firm. It is reported that $6,000,000 were paid for the land by Pittsburgh Consolidation Coal Co. The land is estimated to contain 97,000,000 tons of recoverable coal.

New Preparation Plant

On December 27, M. M. Soule, vice-president, United Electric Coal Cos., at Madisonville, Ky., reported completion of a new $500,000 coal preparation plant at Buffalo Creek. The new plant, near Dawson Springs, will have a daily capacity of 3500 tons.

Status of Brookhaven Reactor

Unforeseen technical difficulties in design, engineering, and construction have delayed completion of the nuclear reactor at the Brookhaven National Laboratory. The reactor was originally scheduled for completion during the fall of last year, but is not expected to start operations for several months.

The major difficulties developed during testing of a new type air cooling system. The tests revealed that the airdust work of the system would not stand up under operating conditions. While alterations are being made on the cooling system, design and construction of other features of the pile, now 90 percent complete, are also being rechecked.

Quebec-Labrador Ore Reserves

Drilling at the Quebec-Labrador iron ore concessions has verified the existence of 355,000,000 tons, with much of the area yet to be explored. Directors of the Iron Ore Co. of Canada made the announcement following their December meeting.

Officers of the company are G. M. Humphrey, president; Jules R. Timmins, vice-president; C. N. Osborne, treasurer; and G. W. Humphrey, secretary.

Anthracite Mine Leased

The No. 6 Colliery, near Wilkes-Barre, Pa., will be reopened after a long period of inactivity. The mine, formerly operated by Jermyn-Green Coal Co., is located in the heart of the Pittston anthracite area. It will be operated by the No. 9 Coal Co., one of the Pagnotti operations. Anthracite produced in the property will be loaded and shipped to the No. 9 breaker for preparation and distribution. Approximately 600 men will be employed in the daily production of 2000 tons.

Synthetic Mica Produced

Mica, a critical material in the production of electrical and electronics equipment, has been successfully synthesized by the Bureau of Standards working on a program carried out in cooperation with the U. S. Bureau of Mines and the Colorado School of Mines.

Inasmuch as the United States only produces a fraction of its own requirements, the discovery is of immense importance. According to Secretary of Commerce Charles Sawyer, over

Flakes of synthetic mica are examined for structural defects

10,000 tons of high grade mica were imported in 1948. In the same period, domestic production of high grade mica totalled only 135 tons. Secretary Sawyer added that synthetic mica may make it possible for the United States to meet its own demands for this critical material.

Synthetic mica is reported to have essentially the same properties as natural mica but superior ability to withstand high temperature. It has four ingredients, quartz, magnesite, bauxite, and a fluorosilicate compound added as a crystallizing agent.

L. E. YOUNG
Consulting Engineer
Mine Mechanization
Mine Management
Oliver Building Pittsburgh, Pa.

Dakota Lignite Firm Formed

At Minot, N. Dak., a group of Dakotans in mid-December formed a new corporation, Baukol-Noonan, Inc. for the purpose of acquiring Baukol-Noonan Lignite, Inc., and carrying on the operation of that company's well-known strip mine, operating on an 800-acre tract of coal land a mile east of Noonan, on the Bertheld-Crosby branch of the Great Northern. The mine has been in continuous operation since 1930. R. E. Schaeffer of Minot will serve as president and work actively in the sales division of the company. Robert W. Palda will serve as resident counsel and as a director. The new group is an all-Dakota corporation.

Largest Lake Carrier

Inland Steel Co. has announced delivery of its new ore carrier, the "Wilfred Sykes," from the American Ship Building Co. The new vessel is the largest ship ever built on the Great Lakes.

On the opening of navigation on the Lakes this coming spring, the new vessel will sail for Superior, Wis., to load her first cargo of iron ore for the Indiana Harbor Works of the Inland Steel Co. The vessel was named in honor of Wilfred Sykes who retired as president of Inland Steel last year and now serves as chairman of the executive committee of the company.

Mining Symposium

On January 17-18, the eleventh annual mining Symposium of the University of Minnesota was held at Duluth. Current problems in underground mining, haulage and concentration were highlighted by operating men conversant with these important topics.

On Tuesday, January 17, papers were presented on "Current Experience in Concentration," "Hardinge Heavy-Media Separator," "Dutch State Cyclone," and "Abrasion Milling." In the afternoon, the Virginia jig plant of the Charleson Mining Co., the Weinig concentrator, flotation of Lake Superior ore, and the principles of pelletizing were discussed in detail.

On the following day the application of sub-level caving to Mesabi Range ores and block-caving in Michigan iron mines was considered. The use of tungsten-carbide bits on the Marquette Range and the support of ground with steel sets were important topics on the program. On Wednesday the trends in mining and tippling practice, the application of power in mobile units, the use of low-pressure tires on earth-moving equipment, incline hoists, and recent conveyor-belt developments were the topics of discussion.

Iron Ore Drilling

Near Crystal Falls, Mich., on the Menominee iron range, the Republic Steel Corp. is conducting exploratory diamond drilling for iron ore on the Hagerman property. Two rigs are in use.

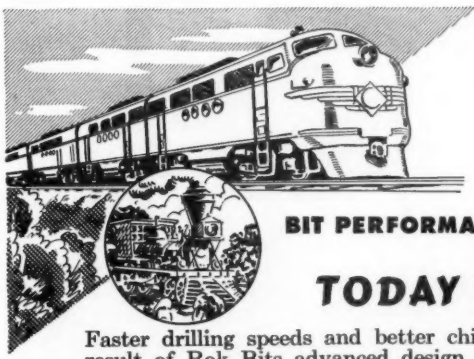
Lignite Production Record

North Dakota coal mines produced a record 2,970,300 tons of lignite during the 1948-1949 fiscal year, it was reported in January. The value of the output was placed at $6,984,272, an increase of more than a million dollars from the previous high, set in 1947-1948, said George B. Easton, state mine inspector. Easton said 499,754 tons of lignite were mined for local consumption; 2,385,085 tons were shipped from the mines and the remainder went into the manufacture of 27,215 tons of briquettes. Ninety-three mines were operated during the year.

Inland Steel Options Steep Rock

Inland Steel Co. of Chicago and Steep Rock Iron Mines, Ltd., of Canada have announced an agreement under which Inland Steel has taken an option to lease from the mining firm a "large, undeveloped acreage, known as the 'C' ore body, in the vicinity of Steep Rock Lake, Ont., for the purpose of exploring and developing a new iron ore mine."

Philip D. Block, Jr., vice-president, Inland Steel Co., pointed out that his organization has recognized the potentialities of Canada's iron ore deposits for a long time. He added



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BIT PERFORMANCE ADVANCES, TOO!

TODAY it's ROK-BIT

Faster drilling speeds and better chip clearance are the result of Rok Bits advanced design. Crown carbides increase cutting speeds. Self-clearing chip channels keep this bit from working in its own cuttings. Check your present drill bit performance against Rok Bits, if you are not already using them . . . and see. Write for details of trial offer and Rok-Bits field-tested 5-way betterment. Rock Bit Sales & Service Co., 2514 E. Cumberland Street, Philadelphia 25, Pa., Branch—Asheville, N. C.

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Better your footage with

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On Field Tests in Every Type of Prospecting and Stripping Throughout the World

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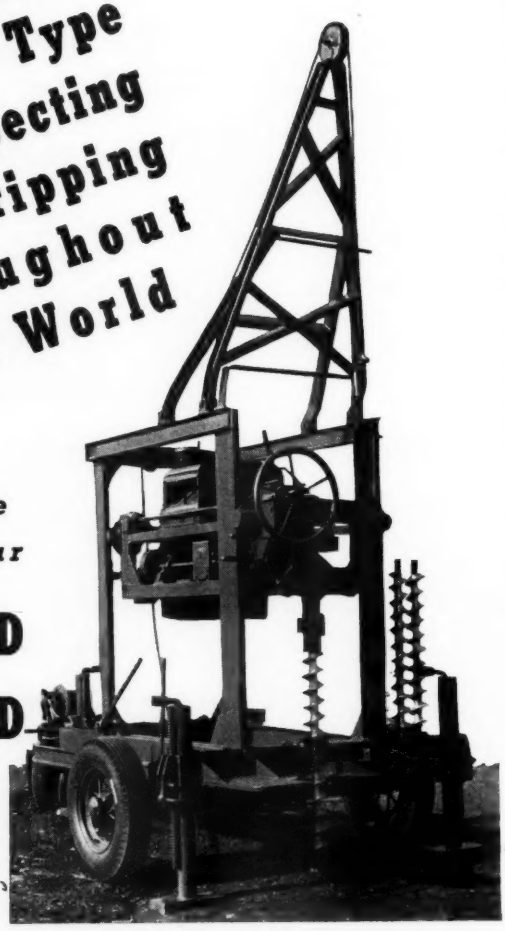
Also available in the popular

STANDARD ONE-SPEED DRILL



The Parmanco Two-Speed Transmission Drill is designed to meet the requirements of the general prospecting field where it is not necessary to drill in solid limestone. Special sliding frame permits drilling and pulling of augers without moving drill. New design of chuck eliminates all hand operation in raising power plant. Recommended for 50 to 60 feet with four and one-quarter inch equipment. Under favorable conditions it is being used to greater depths and can be used with six inch equipment.

PARIS MANUFACTURING COMPANY

PARIS, ILLINOIS

that, if the exploration program proves a large merchantable iron ore body in that area, the acreage option will be operated by the steel company. The exploration program is expected to start at an early date.

At the present time the Steep Rock Iron Mines is shipping ore from its Errington Mine and is actively developing its new Hogarth Mine. During 1949, shipments by the company amounted to more than 1,000,000 tons.

Inland Steel Co. is the largest independent steel producer in the Midwest and ranks seventh among domestic steel producers. The organization operates iron ore mines in Michigan and Minnesota as well as its own coal mine, limestone quarry and lake vessels.

Taconite Ore Development

Plans for the development of the vast low grade taconite deposits of the Mesabi range of Minnesota were recently disclosed by D. C. Jackling, president, Mesabi Iron Co.

Mr. Jackling revealed that Reserve Mining Co., leaser of more than 10,000 acres of taconite owned by Mesabi, plans to set up a pilot plant to beneficiate the ores. The initial planned output of the Reserve plan would be about 2,500,000 tons annually with an ultimate capacity in the 10,000,000-ton per year range.

Gasoline from Coal

Late in December the U. S. Bureau of Mines announced that the Coal Hydrogenation Demonstration Plant at Louisiana, Mo., had completed a continuous seven-week "break-in" run, converting coal tar oil and Wyoming coal to gasoline and other liquid fuels. This was the first time that substantial quantities of oil had been made from tar oil and coal by hydrogenation in the United States. It is expected that, with minor changes and adjustments, the plant will be a useful tool in the development and study of the processes for the conversion of coal to liquid fuel. It is contemplated that a wide variety of other coals will be tested later.

Using two high pressure steps, the demonstration plant was designed to produce 200-300 barrels of liquid fuels daily from coal.

J. W. WOOMER & ASSOCIATES

Consulting Mining Engineers

Modern Mining Systems and Designs
Foreign and Domestic Mining Reports

UNION TRUST BLDG.
Pittsburgh, Penna.

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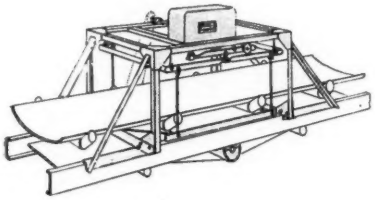
Correction

To avoid any musunderstanding in the article entitled "Weight Control in Coal Preparation" beginning on page 26 of the December 1949 issue of MINING CONGRESS JOURNAL, the perspective drawing of a totalizing conveyor scale installation, in the



right hand column, is a view of the "Transportometer" produced by the Sintering Machinery Corp., 70 Pine St., New York.

"Transportometers" are available as complete units ready for installation for automatic totalizing of the weight of the material passing over a conveyor. They can be provided with remote mounted chart recorders, tonnage indicators, duplicate totalizers and predetermined batch counters.

Winter Activity on the Iron Range

Pickands Mather & Co. are carrying on winter activities at eight mines in Minnesota. On the Mesabi iron range, stripping is active at the Embarrass, Wade, Albany, Scranton, Bennett and the Danube mines. On the Cuyuna range, stripping operations are active at the Mahnomen and the Sagamore mines.

The northern iron mines division of Republic Steel Corp. is active on the Mesabi range of Minnesota and the Gogebic and Menominee ranges of Michigan. Stripping is being conducted at the Susquehanna open-pit mine at Hibbing, and stockpiling from underground production is proceeding at the Tobin mine at Crystal Falls, Mich., and the Penokee mines at Ironwood, Mich.

The Snyder Mining Co. has stripping operations under way at the Webb open-pit iron mine at Hibbing, Minn., on a two-shift basis. Underground mining is active at the Shenango mine at Chisholm, Minn., on a three-shift schedule. No activity is underway this winter at the Virginia mine near Eveleth, Minn.

Michigan Uranium Discovery

Announcement of the discovery of uranium ore on the upper peninsula of Michigan has been made by the Jones and Laughlin Ore Co., a subsidiary of the steel company of the same name. It is the first reported find in Michigan. Size of the deposit has not been determined, neither is it known whether there is enough to make mining operations worthwhile. The firm's chief geologist, Leslie Fam Barrett, said, "We don't know if it is a big vein or just a pocket. All we have right now is just a find." The lode lies in an isolated heavily forested area near Lake Superior. It was found in Baraga county, 15 miles northeast of L'Anse on the Huron river. The area is 190 miles east of Duluth, Minn.

The deposit was found last August by Eiler Hendrickson, an instructor in geology at Carleton College in Northfield, Minn., while employed for the summer by the steel company subsidiary. Scientists of the AEC identified the ore as uranium oxide in the form of pitchblende or uranite. The rock containing the ore is part of an extensive formation. Since the discovery of uranium in the eastern part of the formation at Theano point north of Sault St. Marie, Ontario, Michigan's upper peninsula has been the center of widespread prospecting.

THE Leahy HEAVY DUTY
NO-BLIND VIBRATING SCREEN

How the Leahy Screen Reduces Power Costs

In addition to high operating efficiency (usually well over 98%), the Leahy No-Blind Vibrating Screen has won important recognition by virtue of its low maintenance and power economies.

These economies are effected by (1) a free-swinging screen jacket that eliminates the need for vibration of a heavy screen frame, (2) the operating angle that makes two-fold use of gravity and (3) differential vibration that keeps the mesh clear and screens out over 98% of the undersize, thus reducing the load that is returned to the grinding circuit.

For full information on this durable, economical screen, ask for Bulletin 14H.

THE DEISTER★ CONCENTRATOR COMPANY
CONCENCO PRODUCTS

★ *The ORIGINAL Deister Company* ★ *Inc. 1906*

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Western States

Upshot Undertakes Exploration

Additional exploratory work at the Upshot Mine, Inc., near Mayer, Ariz., is to be financed through the sale of 50,000 shares of $1 par value non-assessable stock. The company was recently incorporated by the former mine owners, A. Sullivan and R. Terrill, Valley National Bank Building, Prescott.

In preliminary work the shaft has been sunk 200 ft, with drifts on the 40, 100 and 200-ft levels. The vein width is said to have increased from two to three feet and to carry good values in gold, silver, lead and zinc.

Gracie Mine Equipped

Development work designed to place the property in production at an early date is progressing at the Gracie mine about nine miles southeast of Nevada City, Calif., purchased three months ago by Gracie-Glencoe Mines, Inc. The property has been rehabilitated and equipped with a headframe, hoist, compressor and electric power at a cost exceeding $30,000.

New Mexico Activities

At Pastura, N. M., M. F. Drunzer, independent operator, has reopened the old Stauber mine, and is shipping siliceous copper ore for fluxing to the El Paso smelter of the American Smelting and Refining Co. William Houser, of Hammer and Houser, Organ, N. M., is producing silver chloride ore from the Barahoni claim.

According to Dr. Vincent Kelley, University of New Mexico professor of geology, New Mexico has produced 7,000,000 tons of iron ore, valued at approximately $15,000,000 since 1889. At present, the principal producing mine is the Boston Hill property at Silver City, operated by the Luck Mining and Construction Co.

In mid-December, the Chino Mines division, Kennecott Copper Corp., went on a six-day work week. Chino is now hauling ore from a newly-developed extension of its huge open-pit mine at Santa Rita. Stripping work, preparatory to mining was done by private contract in an area where the overburden extended to a depth of 300-350 ft. In expanding mining operations, Chino has added a new 10,000-kva generator to its power plant at Hurley and built a new reverbatory furnace at the Hurley smelter. Also under construction at the end of the year was a complete new unit at its precipitation plant at Santa Rita.

Combined Metals Expansion

Combined Metals Reduction Co. recently announced plans to mine and process complex oxidized ores in the Pioche area of Nevada. New concentrating facilities will be constructed at the Caselton, Nev., site of the company's present sulphide zinc-lead mill. The new milling unit will treat 330 tons of oxidized ore per day. Ultimate capacity may be approximately 1000 tons.

Present plans are predicated upon an investigation begun in 1934 of the complex ore containing manganese, lead, zinc, gold and silver. The decision to proceed with the new program involved acquisition of power from Hoover Dam and space in the Basic Magnesium plant near Las Vegas, Nev.

Eastern Lead Corp. Formed

An Inland Empire group recently formed the Eastern Lead Corp. with Donald A. Callahan as president to undertake development of claims held near Mullan, Idaho. According to J. V. Grismer, general manager, development work will be started in the spring.

Callahan Consolidated Mines Co., of which Callahan is also president, holds a one-fifth interest in the property.

San Manuel Progress

Consistent progress is being made by the San Manuel Copper Corp. in the planned exploration program for the development of its low-grade ore deposit near Tiger, Ariz. At mid-December, the No. 1 shaft had attained a depth of 1230 ft, and the No. 2 shaft was down 931 ft.

The No. 1 shaft is a four-compartment rectangular shaft, using steel sets and lined with reinforced concrete. A major pump and electrical sub-station were installed on the 800-ft level, above the water table. A small booster pump station is being provided on the 1200-ft level. The shaft at present is making 100 gpm.

During 1949, a 90-ft steel headframe with 300-ton steel bins, a 225-hp, double-drum sinking hoist and an electric sub-station were erected at the No. 2 shaft site. This shaft is being sunk in the heart of the ore body and is a three-compartment rectangular shaft using treated timber sets and lining. Small, auxiliary relay pump stations were installed at 400 and 800-ft depths. At present the shaft is making 185 gpm, practically all of which is coming from the conglomerate beds above the 800-ft pump station. Ore was encountered at a depth of 705 ft.

Headframe and machine shops at the No. 1 shaft, San Manuel Copper Corp. This four-compartment shaft is located 2000 ft in the footwall of the San Manuel ore body and has reached a depth in excess of 1230 ft

Salt Lake City, Hub of Industrial West, Site of 1950 Metal Mining Convention and Exposition

AN outstanding convention and exposition of the metal and nonmetallic mining industries is shaping up under the guiding hand of D. D. Moffat of Salt Lake City, Chairman of the Western Division of the American Mining Congress. Mr. Moffat, long a leader in western mining activities, was vice-president and general manager of the Utah Copper Division of the Kennecott Copper Corp., before retiring last year. Under his leadership an able group of committees are being formed who will work to make the 1950 meeting, in Salt Lake City, August 28-31, of the utmost value to the operators and management of the domestic mining industry.

D. D. Moffat

Roy A. Hardy

A convention program of noteworthy interest is assured with the acceptance of the chairmanship of the Program Committee by Roy A. Hardy, consulting engineer in charge, Getchell Mines, Inc., of Reno, Nev. State Chairmen and members of the Program Committee will be appointed at an early date. To aid this committee in its efforts to draw up a program of the widest possible interest, members of the mining industry are urged to send suggestions as to topics and speakers to the American Mining Congress, Ring Building, Washington 6, D. C.

Mining equipment and supplies of all kinds will be featured in the exposition to be held concurrently with the convention. A large number of leading manufacturers have applied for exhibit space, and assignments already made exceed the total space used by the record-breaking Metal Mining Show held in San Francisco in 1948. Metal and nonmetallic mining men will find the exposition a valuable occasion to inspect the latest developments in mining machinery, equipment and supplies and to discuss their operating problems with the manufacturers.

Preparations for luncheon meetings, the Annual Banquet, trips and other entertainment features are being made by various arrangements committees, announcement of which will be made in the near future. James K. Richardson, manager, Utah Mining Association, is taking an active part in coordinating these arrangements.

Application for housing accommodations should be made at an early date to Mrs Winifred P. Ralls, Convention Bureau, Chamber of Commerce, Box 329, Salt Lake City, Utah. Now is the time to make plans to attend this exceptional annual meeting of the mining industry. Make your reservations now and arrange to be on hand in Salt Lake City, August 28-31!

Winter Closes Carbonate Mines

Development of the Carbonate Mines property near Marysville, Mont., has been suspended for the winter, according to a letter to stockholders of New Jersey Lead Mines from J. B. Phillips of Spokane, Wash., secretary. Work on the property has been under the direction of Silver Dollar Mining Co., for New Jersey Lead and King of Pine Creek, which hold majority interests.

New Colorado Coal Field

Detailed studies of the geology and coal resources on the northwestern rim of the great San Juan basin of New Mexico and Colorado have revealed more than 1,000,000,000 tons of coal of high quality at depths of less than 1000 ft below the surface. This is the report of the U. S. Geological Survey, released recently. The coal is estimated to be present in beds more than 28 in. thick. Though only 64,000,000 tons may be considered measured or proven, more reserves could be proved, according to the report, by systematic core drilling.

Arizona Copper Exploration

Churn drilling at the Lone Star claim, 12 miles north of Safford, Ariz., has been started by Consolidated Coppermines Corp. of Nevada as the first step in an extensive exploration program to test the copper ore deposits of that area. Contract for the drilling is held by Wenninger Brothers, Safford.

In addition to the Lone Star, Consolidated Coppermines has optioned a large number of adjoining claims with diversified ownership. Included in the group are part of the holdings of Albert Spaulding and Paul Merrill. John Hope, chief geologist for Consolidated Coppermines, is in Safford directing the work.

Molybdenum Mill Planned

Spokane Molybdenum Mining Co. plans a mill to be built next summer at its five-claim property on the Spokane river, north of Davenport, Wash., according to Luke J. Bayley, president. The property is believed to be within an extension of the Cedar Canyon ore zone in Stevens county, which has produced some molybdenum, tungsten, silver, lead and copper. Exploratory work has been done, with some adits 200 ft under the surface showings. The projected mill will be large enough to handle 500 tons, but only 100-ton equipment will be installed this year.

Manganese Mill Burns

For the second time in a little more than two years, the Trout Mining Co.'s manganese mill near Phillipsburg, Mont. was destroyed by fire. No injuries were reported in the blaze which occurred early in Jan-

uary. The flames swept through the entire mill, gutting the structure and destroying the adjacent bins. L. B. Manning, manager of the mill, reported the blaze apparently started in the boiler room of the plant. The mill employed between 12 and 16 men, including truck drivers. In October 1947, the Trout mill was also leveled by fire. The company undertook rebuilding of the structure and the mill was returned to operation in December of that year.

Utah Coal Mine Fire

A report given by John Dorick, vice-president and general manager of the Hi-Heat Co. said indications were that the week-long fire in its Rains coal mine in Carbon county, Utah would cost an estimated $15,000 in labor, and $3000 to $4000 in materials for repair and an undertermined sum in coal consumed. The blaze occurred in mid-December.

The fire was believed to have been caused by a heavy voltage cable carrying power to the mine machinery. The fire was in a main air course, resulting in such good circulation that fumes and smoke were carried away and the wearing of masks in fighting the fire was not necessary. Work in other parts of the mine progressed until inspectors ordered all miners out of the mine.

Potash Strike Ends

Since November 19, 1949 potash mines at Carlsbad, N. M., were closed by a strike of the International Union of Mine, Mill & Smelter Workers. The Carlsbad Potash Local 415, with a membership of 1500, picketed the plants, cutting severely into the future supply of essential fertilizers.

On January 31 the strike was over and full production was resumed. The two and one-half month strike had a net result of missing pay checks for the miners and a curtailment of potash output. In returning to work at the mines, the strikers achieved none of their desired objectives.

Southwest Mining Association

At its annual meeting, The Mining Association of the Southwest, with membership largely in southern California and Nevada, elected officers for 1950. Tasker L. Oddie, former United States Senator from Nevada was the principal speaker. He recounted personal experiences of his youth during the boom days of Tonopah and Goldfield. Mr. Oddie worked 12 years to gain adoption of the bill authorizing construction of Hoover Dam. Howard Kegley was re-elected president, a post he has held for 12 years. Other offices re-elected were: H. H. Howe, first vice-president; John Herman, second vice-president; P. J. Osdick, third vice-president; and Victor J. Hayek, secretary-treasurer. The board of directors consists of Victor M. Arciniega, Clifford G. Burton, George W. Clemson, John H. Eggers, C. W. Fernholtz, William R. Harriman, W. W. Hartman, C. Colcock Jones, S. Paul Lindau, Harry L. Martin, C. H. McIntosh, Thomas H. Warren and Edward G. Witt. Burton, Fernholtz and Martin are new board members.

Nevada Manganese

Manganese production from the Black Diablo mine in Pumpernickle valley, 21 miles from Golconda, Nev., is reported ranging from 450 to 600 tons of ore a month. It is trucked to the Geneva Steel Co., at Provo. Controlled by Charleston Hill National Mines, the mine is credited with containing a large deposit of shipping grade ore.

Warren Basin Possibilities

A recently released report on the Warren basin gravels in Idaho county, Idaho, indicates that a single dredge could probably produce, in a few days, as much monazite as the United States used in 1935. The basin is estimated to contain approximately

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50,000,000 cu yd of gravel that could be dredged. Since 1930 dredging operations have been carried on intermittently for gold. At present, Rare Earths, Inc. is operating a Yuba-built, bucket-ladder dredge to recover gold, monazite and other minerals. Approximately 2000 cu yd per day are being handled.

Dredges Produce Bulk of California Gold

Dredges in California harvested 60 percent of that state's 1949 gold yield, recording the best production since 1941. Approximately 25 bucketline, 30 dragline and a few suction dredges operated in scattered placer fields from the Klamath River, Siskiyou county to the Fresno and Chowchilla rivers in Fresno and Madera counties. The gold dredging industry employs about 1500 men. Many dredges have been equipped with jigs for recovery of gold in its native state, for sale at the price the producer can obtain.

Yuba Consolidated Gold Fields retained its place as California's largest gold producer last year, with value of gold recovered reported to have exceeded $3,100,000. The company operates six dredges in the Yuba river field near Marysville, Yuba county; two on Butte creek in Butte county, and one in the Seiad area of Siskiyou county. It is resuming dredging at its Sunny View property south of Chico and preparing to redredge 5000 acres in the Yuba river area. Yuba river dredges are equipped with buckets of 18-cu ft capacity and handle 450,000 cu yd of material monthly.

Natomas Co., operating seven dredgers in the American River field near Folsom, northwest of Sacramento, was California's second largest placer gold producer last year. The company reported earnings of $557,470 for the nine months ending September 30 before taxes, compared with $722,325 for the same period in 1948.

Silverton Mines Unwatered

The new camp of Silverton Mines, Inc., at its recently acquired Cumberland property, near White Sulphur Springs, Mont., has been completed, according to L. L. McLean, director. It includes a cookhouse, dry room, blacksmith shop, housing for the generators and hoist, and five cabins. The crew has been increased in order to start immediate underground operations. The recently unwatered shaft was found to be in good condition.

The mine was closed in March, 1892, when the silver price dropped out of sight and lead was selling for 2½¢ per pound. Old smelter returns show that 17,000 tons of crude ore ran 30 percent lead, 27 oz silver, plus .25 oz gold.

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Combine your knowledge of your property with Yuba's specialized engineering ability, and you'll get a dredge that will consistently deliver maximum yardage at low cost. You'll get early delivery, too, because Yuba's shop and crew are geared to fast production and dredge erection. Find out for yourself what we can do for you. Wire or write NOW. No obligation.

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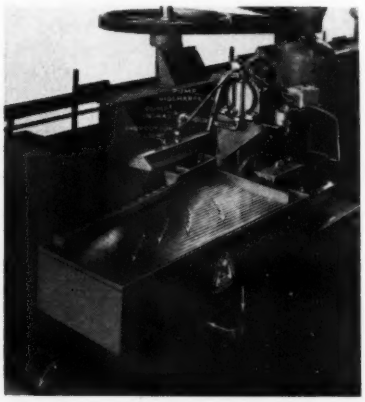
Manufacturers Forum

Visual Sampler

A visual sampler has been announced by the Denver Equipment Co. for quick, visual inspection of mineral concentrating efficiency. Changes in grind, flotation time, reagent application or cleaning and recleaning arrangements can be made and put into effect.

The sampler is a self-contained unit



consisting of a ¾-in. Denver suction-pressure pump and a pilot-size Denver-Wilfley concentrating table driven by one ½-hp motor.

In operation, the pump draws pulp from the concentrating machine and pumps a metered flow to the feed box of the pilot table where visual inspection reveals gravity composition of pulp. Table concentrate and tails are returned to the concentrating machine. Sampling is constant. Further information may be obtained from the Denver Equipment Co., 1406 17th Street, Denver 17.

Tank Connector

An effective device has been designed to save time in making pipe to tank connections by the American Pipe & Steel Corp., Alhambra, Calif. It is said that by using the Unitank flange cutter, pipes may be connected to the inside or outside of the tank in only a few mintes.

The Unitank flange cutter operates on a simple combination punching and shearing can-opener principle for cutting steel up to and including 3/16-in. thick. The two piece Unitank flange is inserted through a hole of the proper size from the inside of the tank. The tightening nut has one face flanged out and finished and is attached by means of a left-handed thread. Thus tightening a pipe in the flange tends to tighten the flange in the tank. Only one gasket is necessary.

Bolt Hole Drill Bits

Designed for drilling the holes for the insertion of roof bolts, the new method of suspension roof support, Kennametal Inc., Latrobe, Pa., has announced a cemented carbide rotary bit. The bit is for drilling in hard shale, slate and laminated sandstone. Drilling speed is claimed to be 10 to 20 percent faster than with pneumatic methods.

D-C Power Unit

Designed to meet the new requirements for dc power for mining coal with recently developed continuous-type machines, a portable 300-kw motor-generator set, together with auxiliary control gears, has been announced by Reliance Electric and Engineering Co. The relatively light weight power center is designed to follow the advance of continuous-type mining machines. As mining progresses, the motor generator set with its control and switch-gear is advanced to permit the continuous mining equipment to move ahead. Each mounted unit is built to provide adequate protection against rough handling. It is driven by a 2300-v, 450-hp synchronous motor, reported to be capable of handling a 25 percent over-

Continuous Miner Goes Abroad

A Joy 3-JCM Continuous Miner has been shipped to the Donisthorpe Colliery in England. Men at the mine will be given a complete course in the operation and maintenance of the machine before the unit is placed in operation in conjunction with Joy 42-D, battery-powered shuttle cars.

The management of the colliery hopes that the continuous miner will be of material assistance in aiding production at the Donisthorpe Colliery. Mining is done in the Stockings seam, which is approximately 8½ ft thick. About 2500 tons per day are being produced by a long wall system and haulage by belt conveyor from the face to the shaft column. The normally faulty Stockings seam has a soft band at the floor and hardness increases continuously toward the roof.

load for two hours and 100 percent overload for one minute. Through its sectionalized distribution panel it will serve two continuous-type mining machines and associated equipment such as shuttle cars and convevors.

Vibrating Conveyor

A mechanical vibrating conveyor operating on a system of balanced forces is now available from the Jeffrey Manufacturing Co., Columbus, Ohio. The conveyor deck is mounted on cantilever spring bars, two beam sup, orts, and has a counterweight also mounted on cantilever spring bars, and a drive. The weight of the conveyor deck and the counterweight are balanced and designed to maintain the balanced forces using but little operating power. Up to 80 ft of conveyor can be operated from one drive unit. The MV type conveyor is said to be able to handle abrasive, lumpy or rough material, hot or cold, dry or wet on grades as steep as ten degrees.

New Magnetorque Unit

Since the introduction of the "magnetorque" swing several years ago in the three to four cu yd Hornischfeger P&H modle 1055 excavator, the successful application has warranted using the swing system on a 2½-cu yd shovel. The new model 955-A, in addition to being equipped with the electro-magnetic type swing mechanism, has heavy duty hydraulic control of the automotive type. The unit can be converted for four types of service: shovel, dragline, crane and clamshell.

Sinker Drill

The Chicago Pneumatic Tool Co., New York 17, N. Y., recommends its new CP-59 for holes up to 25 ft. The new drill features a four-in-one backhead enabling changeovers to either plain dry, blower-dry, wet or air-water operation, by removing a plug and changing wet and dry valve assemblies.

Trailer-Mounted Generator Sets

Production has been announced by the International Diesel Electric Co. of a complete line of self-contained, trailer-mounted electric generator sets in capacities ranging from 10-85 kw. The new units are available in both Diesel and gasoline models, 50 and 60 cycles, and in all standard voltages. The sets consist of an engine driving a generator, with an instrument panel containing all starting controls and switchgear, spring-mounted on a pneumatic-tired four-wheel trailer.

Redesigned Truck Line

A completely redesigned and re-engineered line of International trucks has been announced by the motor truck division of International Harvester Co. The new L-line of heavy duty engineered trucks consists of 87 separate truck chassis models designed to handle every conceivable type of hauling job. Features of the new L-line are complete restyling with extreme practicability; a new "Comfo-Vision" cab to provide more roominess, comfort and all-round visibility; new chassis dimension engineering for better load distribution, maneuverability and engine accessibility; an improved valve-in-head series engine; and other mechanical and engineering improvements to effect important cost reductions for the operator.

More than $30,000 was spent for the vast production change-over required to build the new L-line of International Harvester Trucks.

— *Announcements* —

S. W. Rolph, formerly executive vice-president, the **Electric Storage Battery Co.**, has been elected president to succeed **R. C. Norberg**, who has been elected chairman of the board of directors.

Dr. **Wilber H. Miller** has been named technical representative and assistant manager of the **American Cyanamid Co.'s** Washington, D. C., office.

Edwin H. Keiper has been made chief service engineer of the **Pennsylvania Crusher Co.**

T. L. Jensen has been appointed sales manager of the **Colorado Iron Works Co.**

T. T. Pattison has been appointed district manager in charge of sales and field operations for the **National Mine Service Co.** in Illinois, Indiana and Western Kentucky.

Paul M. Barlow has been named manager, mining sales, Mines Equipment Division, of **Joy Manufacturing Co.**

Mine Safety Appliances Co. has established an international division to coordinate activities of subsidiaries in Canada, South Africa and Great Britain, and to continue the activities of the export department. **C. M. Donahue** will be manager of the new division in addition to his present duties as manager of the mining division. **H. E. Redenbaugh** will be assistant manager of the international division.

David E. Allen has been named sales manager of the **Anaconda Wire & Cable Co.** and will become assistant to **L. R. Love**, general sales manager.

Herbert G. Kieswetter has been appointed assistant general manager of the mechanical goods division of the **U. S. Rubber Co.**

CATALOGS AND BULLETINS

COAL CAR THAWING. *Hauck Manufacturing Co., Brooklyn 15, N. Y.* Thawing equipment for freeing the material in frozen coal cars, ore cars, etc., are described in detail along with accessories used in thawing operations. Hauck thawing pits utilize the radiant method of heating coal hoppers and avoid direct flame contact. Complete information is available from the company on request.

HEAVY DUTY SCALPER. *Hewitt-Robins Inc., Robins Conveyor Division, Passaic, N. J.* A new bulletin on the heavy-duty scalper describes the vibrating machine for scalping off lumps of solid coal weighing as much as 1½ tons. The mounting is said to absorb the weight of impact so that no vibration is imparted to the base of the scalper or its supporting structure.

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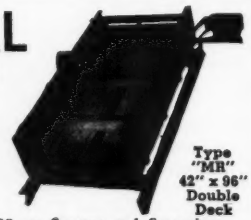

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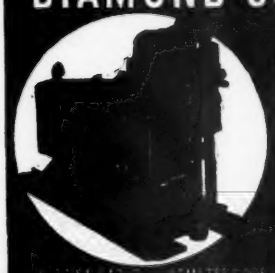

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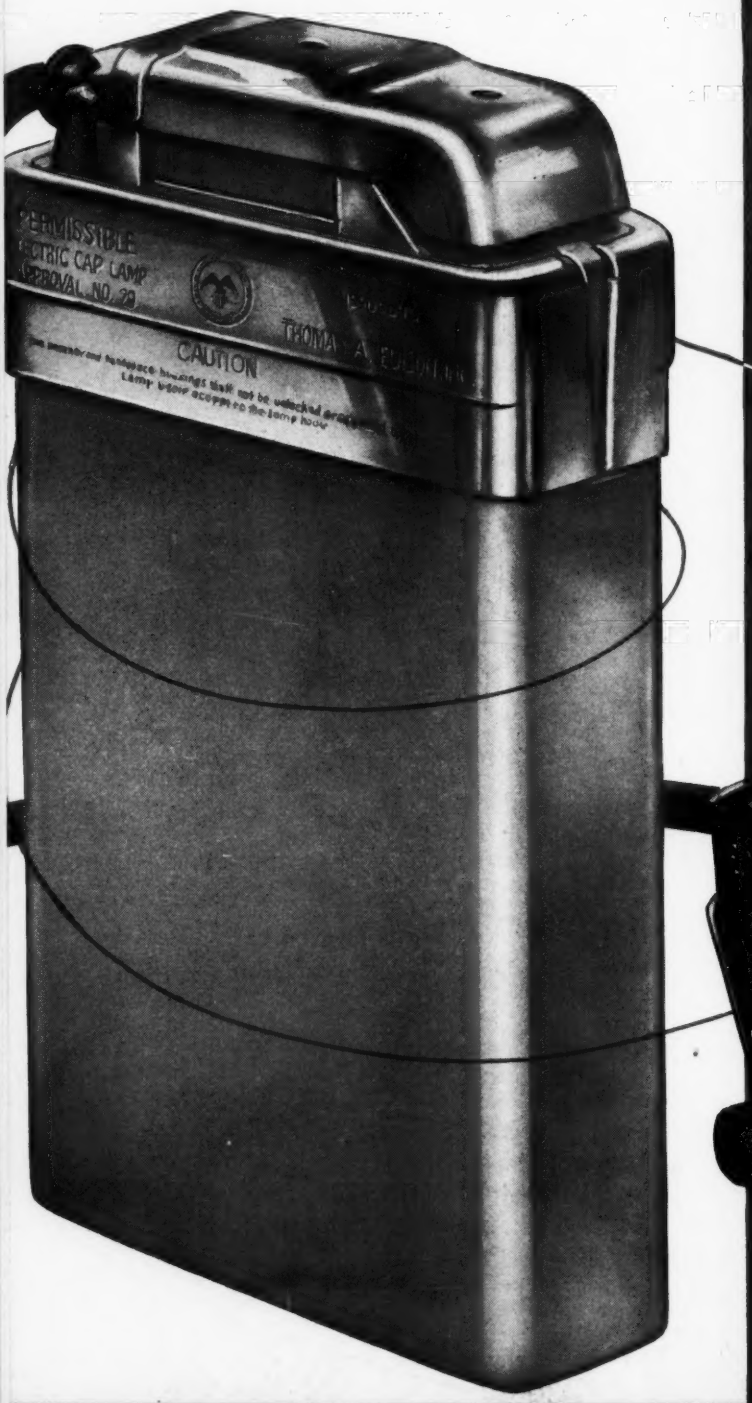

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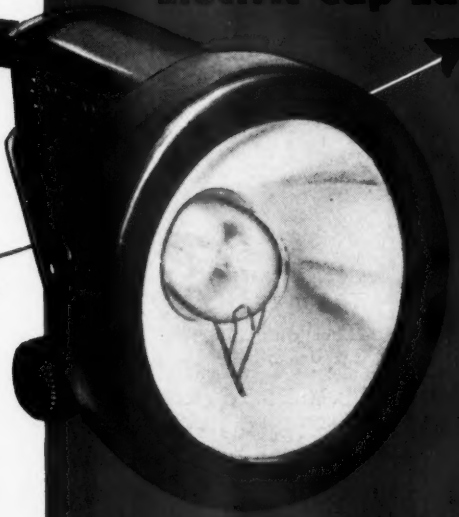

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